RECREATION

I. Affected Environment

A. Introduction

Streams, lakes, and reservoirs within the study area provide a valuable water resource that helps support two of the most important recreation activities in America: boating (rafting, kayaking, canoeing, and flat water power craft) and fishing. Streams, lakes, and reservoirs also support other popular water-based activities, including swimming, sightseeing, tubing, and camping (which occurs primarily near the water).

The Truckee River and its tributaries and nearby reservoirs service the recreation needs of one of the fastest growing population centers in the United States—the Tahoe, Truckee, and Truckee Meadows areas (Auckerman, et al., 1999). Recreation settings and activities associated with water bodies throughout the study area are accessible, affordable, and diverse.

The numerous recreational resources and opportunities in the study area range from forested mountains in California to arid deserts in Nevada. The California portion of the study area is characterized by high country rivers, reservoirs and natural lakes, and outstanding scenery. The Nevada portion of the study area is characterized mainly by high desert terrain, riverine vegetation, rivers, Pyramid Lake, reservoirs, and wildlife areas.

The gaming industry in Nevada, combined with the setting and recreational opportunities, makes the study area a primary destination for tourists. Recreationists are drawn mostly from the San Francisco Bay area, Sacramento, and Reno. Since 1960, the Squaw Valley Olympic site has attracted visitors from all over the world for skiing during the winter and unique ski area activities during the summer.

The water-based recreation season considered in this analysis is the 7-month period from April through October, when recreationists are most likely to use the Truckee River and its associated reservoirs and lakes. Other months of the year are cold and snowy, deterring many visitors, except skiers and snowboarders.

Table 3.82 presents recreation activity participation rates that reflect interview research completed in August 1995 and updated in 1999 by the University of Nevada, Reno (UNR) for Reclamation. These data are the most recent detailed data available. The 1995 interviews were conducted in the final years of a drought; therefore, participation rates could be somewhat low. Table 3.82 also compares the recreation activity participation rates in the Truckee River basin to those of Californians in general (derived

Table 3.82—Recreation activity participation at lakes and reservoirs in the Truckee River basin (percent of population)

Recreation activity	California SCORP	Truckee River basin interviews by UNR
Picnicking	64	31
Camping	46	65
Fishing	37	57
Swimming	59	34
Boating	20	19
Fishing from boat	No data	33
Water skiing	14	28
Jet skiing	No data	15
Rafting	No data	7
Kayaking	15	3
Biking	23	15
Other activities	No data	30

from the California State Comprehensive Outdoor Recreation Plan [SCORP]). The survey showed 3.37 activities per person per day, confirming the diversity of activity interest. Camping, fishing, water skiing, and "other activities" had high participation rates.

Table 3.83 (also a result of UNR interview research) presents repeat visitation at lakes and reservoirs in the Truckee River basin in 1993 and 1994. The amount of repeat visitation indicates that visitors are satisfied with the recreation experiences associated with the recreation resources, facilities, and opportunities at lakes and reservoirs in the Truckee River basin. Table 3.83 also displays percentages of visitors who made repeat visits. The number of visits represents how many times the interviewees visited each reservoir during the year.

Table 3.83—Repeat visitation at lakes and reservoirs in the Truckee River basin

	1993		1994	
Lake/reservoir	Percent of repeats	Number of visits	Percent of repeats	Number of visits
Donner	No data	No data	46	5
Prosser Creek	19	8	16	6
Stampede	53	4	37	4
Boca	49	11	26	6
Pyramid	28	8	36	10

B. Recreation Facilities

Recreation at Donner Lake and Prosser Creek, Stampede, and Boca Reservoirs could be affected by modifying operations of Truckee River reservoirs. Operations model results show that the proposed action would have a minimal effect on Lake Tahoe and Independence Lake water surface elevations; therefore, effects on recreation would be minimal and are not analyzed. Also, because the proposed action would have no effect on smaller facilities, such as Webber Lake and Martis Creek Reservoir, effects on recreation at these facilities are not analyzed.

1. Lakes and Reservoirs

a. Lake Tahoe

A wide variety of recreational activities occur on Lake Tahoe's 122,200 water surface acres and along its 71 miles of shoreline. Adjacent recreation lands and facilities are primarily owned and managed by USFS, California and Nevada, local entities such as North Tahoe and Tahoe City Public Utility Departments, and South Lake Tahoe. Intermingled with the government-operated areas are privately-owned and operated campgrounds, marinas, golf courses, hotels, restaurants, casinos, and numerous resorts and other commercial businesses.

Lake Tahoe is a primary destination spot for visitors from all over the United States and offers year-round recreation opportunities. Visitation is greatest during the summer recreation season (June, July, and August); however, the 25 ski resorts in the area and the casinos attract a large number of visitors through the winter season. The primary recreation activities are sailing, boating, gambling, water skiing, camping, scuba diving, windsurfing, swimming, sightseeing, hiking, photography, and fishing for mackinaw, kokanee, rainbow trout, and brown trout.

The visual quality of Lake Tahoe is considered outstanding, especially in light of the amount of commercial development on adjacent lands and along the lakeshore. The large oval-shaped basin and lake, rugged shoreline, and dense pine forests offer enough absorptive characteristics to lessen the effects of development and visitor use on the surrounding landscape.

b. Donner Lake

Donner Lake is located on Donner Creek. Donner Lake Dam, near the western edge of Truckee, California, was originally constructed in 1877 at the natural lake's outlet and rebuilt in 1933. Today, the dam site is surrounded by Donner Memorial State Park. Recreation facilities are owned by California Department of Parks and Recreation, Truckee-Donner Recreation and Park District, Tahoe-Donner Homeowners' Association, Donner Lake Homeowners' Association, and individual private landowners.

Truckee-Donner Recreation and Park District is responsible for operating and maintaining several facilities at Donner Lake, including two beaches, 36 piers, and the only public boat launch ramp. Tahoe-Donner Homeowners' Association maintains a beach and boat launch facility at the east end of Donner Lake. Donner Lake Homeowners' Association maintains 330 feet of lakefront and two private piers on the north side of Donner Lake.

Numerous second homes and condominiums are located around the shoreline. During the summer and winter, many residences are rented for family vacations. Most visitors are from the San Francisco Bay and Sacramento areas. The aesthetic qualities include views of the lake and mountains, the shade and scent provided by the mature trees, and the relative serenity.

Donner Lake visitation is as follows:

- Truckee-Donner Recreation and Park District (1999): about 77,600 visits between Memorial Day and Labor Day. Total estimate, April through October: 108,640
- Tahoe-Donner Homeowners' Association, east end of lake (1988-93): annual summer usage varied from 16,680 to 26,456 people
- Donner Lake Homeowners' Association: average annual attendance of 40,000 people
- Donner Tract Homeowners' Association, north side of lake: no visitation records available
- Donner Memorial State Park: 200,000 visitors annually

The ideal elevation at Donner Lake is 5935 feet msl. At this elevation, public and private facilities are fully usable. The 36 piers are used by swimmers, fishermen, and boaters. However, at elevation 5934 feet, use of many of the facilities becomes marginal. In particular, the boat launch ramps at Tahoe-Donner Homeowners' Association facilities and Donner Lake Homeowners' Association facility are barely usable below elevation 5934 feet. Safety becomes a concern at the public piers because the water is shallow. At elevation 5933 feet, only the public ramp is usable; all other boat ramps and piers are unusable.

The 1943 Donner Lake Indenture directs that Donner Lake not fall below elevation 5932 feet during June, July, and August, except to meet minimum streamflow requirements. (See chapter 2.) Additionally, dam safety requirements specify that the discharge gates of the dam be held open from November 15 through April 15 to prevent it from exceeding elevation 5926.9 feet. Drawdowns may occur in September and October in anticipation of opening the discharge gates to meet this requirement. The maximum elevation of Donner Lake is 5940 feet.

c. Prosser Creek Reservoir

Prosser Creek Dam and Reservoir, completed in 1962, are located on Prosser Creek 1.5 miles upstream of its confluence with the Truckee River. USFS manages and operates recreation facilities at the reservoir. The project has 2,070 acres of land, 748 surface acres of water, and 12 miles of shoreline.

Recreation facilities include three boat launch ramps with two lanes each, eight toilets, and three campgrounds, with a total of 46 campsites. There are no concession facilities or cabins on the project lands. USFS collects $12-per-night user fees for the campsites through a private campground concessionaire.

The most popular recreation activities are fishing, motor boating, and picnicking. During the fall, hunting for mule deer, geese, and ducks is popular. CDFG stocks kokanee and rainbow and brown trout in the reservoir.

Prosser Creek Reservoir is the smallest of the three reservoirs in the upper Truckee River basin. It is more appropriate for recreation use by small, slow watercraft. Local officials enforce several restrictions, including a 10-mile-per-hour speed limit and a boat movement traffic pattern. The reservoir's physical characteristics and management make it popular for fishing, paddle boating, canoeing, and water play. There are no designated swimming areas, but visitors wade and swim. The reduced speed and traffic patterns reduce conflicts among the activities. The reservoir is also conducive to passive uses on the water and shoreline. Nearby residents enjoy taking walks to and around the reservoir.

No recent site-specific recreation visitation data are available for Prosser Creek, Stampede, or Boca Reservoirs. In 1995, USFS changed its visitor use reporting system at the direction of Congress. Recreation visitation reported since that time using the newly established system is on a forest-wide basis with limited site-specific information.

When the reservoir elevation is 5724 feet (548 surface acres) or greater, use of the boat launch ramps is unimpaired. When the elevation is less than 5724 feet, the ramps become less usable, and the following changes occur:

- Larger boats have limited access to the water. If boats are launched in areas without a ramp or off the old Highway 89 roadbed, the vehicle, trailer, or boat may get stuck in the mud.

- Aesthetics of the reservoir and USFS campground decline due to the "bathtub ring" effect.

- Visitors must travel greater distances from the water to the toilet facilities.

- Conditions for stocking fish in the reservoir are marginal.

d. Stampede Reservoir

Stampede Dam and Reservoir, completed in 1970, are located on the Little Truckee River 8 miles upstream of its confluence with the Truckee River. USFS manages and operates recreation facilities at the reservoir. The project has 10,740 acres of land, 3,452 surface acres of water when full, and 29 miles of shoreline.

Recreation facilities include one picnic area with four tables, one boat launch ramp with three lanes, 20 toilets, and seven campgrounds, with a total of 256 campsites; and three group camp facilities that accommodate 150 people. USFS collects $15-per-night user fees for the campsites through a campground concessionaire.

The most popular recreation activities during the summer are fishing, camping, and motor boating. During the fall, hunting for mule deer, geese, and ducks is popular. CDFG stocks kokanee and lake, rainbow, and brown trout.

Stampede Reservoir is the largest reservoir in the Truckee River basin. It is about a 20-minute drive beyond Boca Reservoir, which makes it slightly less accessible to visitors traveling the main roads in the area.

Stampede Reservoir boat launch ramps provide unimpeded access to the water when the elevation is 5881 feet (1,475 surface acres) or greater. When the elevation is lower than 5881 feet and the boat ramps are less usable, the following changes in recreation occur:

- Number of boats launched decreases.
- There is a substantial walk from the water to parking facilities and toilet facilities.
- The campground is somewhat removed from the reservoir shoreline. Anglers tend to drive to and use different areas of the reservoir to avoid crossing the foreshore mudflats. Toilet facilities in the day use area are not close to the water, and visitors must walk up to one-half mile to them.
- Aesthetic qualities around the reservoir diminish. Odors from decaying vegetation, mudflats in the foreshore area, and turbidity in the water all occur. Turbidity reduces the quality of the fishing experience.
- The growth rate of kokanee is reduced, which reduces the quality of the fishing experience.

e. Boca Reservoir

Boca Dam and Reservoir, completed in 1939, are located on the Little Truckee River about 3 miles downstream from Stampede Dam and immediately upstream of the

confluence of the Truckee River and the Little Truckee River. USFS manages and operates recreation facilities at the reservoir. The project has 3,052 acres of land, 887 surface acres of water, and 15 miles of shoreline.

Recreation facilities include one boat launch ramp with two lanes, five toilets, and two campgrounds, with a total of 59 campsites. USFS collects $12-per-night user fees for the campsites through a private campground operator.

The most popular recreation activities are fishing, camping, water skiing, windsurfing, and jet skiing. During the fall, hunting for mule deer, geese, and ducks is common. CDFG stocks kokanee and rainbow and brown trout.

Boca Reservoir boat launch ramps provide unimpeded access to the water when the elevation is 5591 feet (822 surface acres) or greater. When the elevation is lower than 5591 feet, the following changes in recreation occur:

- Large watercraft use decreases.
- Shallow waters tend to be warmer and more inviting to waders and swimmers in areas with beaches. Broad expansive mudflats, however, are not conducive to swimming.
- After mud flats dry, off-road vehicles, dirt bikes, and mountain bikes use the reservoir's expanded shoreline.
- Ski Jump Cove, where a ski club practices water skiing skills, cannot be used. The favorable water ski dropoffs and takeoffs are no longer useable.
- Noise is reduced because of fewer boat engines, but more reservoir foreshore is exposed, revealing mud flats and odors from decaying vegetation.

f. Lahontan Reservoir

Lahontan Dam and Reservoir, completed in 1915, are located on the Carson River. Nevada Division of Parks manages the water surface area, consisting of 12,100 acres at full pool; adjacent lands, consisting of 18,262 acres; and associated recreation facilities for recreation purposes. The reservoir has approximately 70 miles of shoreline. Seasonal entrance fees are collected at the two main access points located at Churchill Beach and Silver Springs Beach.

Lahontan Reservoir offers a number of facilities and opportunities to western Nevada residents, the primary users of the reservoir. Facilities include one developed campground with 27 sites, two boat ramps, six restrooms with flush toilets and showers, 12 vault toilets, 12 pit toilets, and three restrooms with flush toilets but no showers. The beach areas are open to public camping. The recreation season extends from April 1 to October 31. Recreation activities include boating, jet skiing, water skiing, camping,

fishing, sightseeing, picnicking, hunting, and swimming. Fishing occurs primarily from boats. The warm water fishery supports walleye, white bass, catfish, largemouth bass, sunfish, and a cool water fish, rainbow trout. The reservoir holds the State record for walleye. Table 3.84 presents recreation visitation at Lahontan Reservoir from 1993–2002. Data are from Summary Statistical Data Sheets, Nevada Division of Parks.

Table 3.84—Recreation visitation at Lahontan Reservoir: 1993–2002

Year	Total recreation visitation (number of visitors)
1993	356,844
1994	246,471
1995	460,222
1996	436,939
1997	385,750
1998	384,253
1999	383,493
2000	584,918
2001	325,330
2002	331,181

The boat ramps provide unrestricted access to the water when the reservoir elevation is 4138 feet or higher. When the elevation is lower than 4138 feet, the following changes in recreation use occur:

- Number of boats launched decreases, especially larger boats.
- Decreased surface area compromises the safety of boaters using the reservoir.
- Visual quality of the reservoir decreases due to exposed mud flats.
- Access to developed facilities from the shoreline becomes more difficult.
- Visitation to the reservoir decreases.
- As the mudflats dry, off-road vehicle use increases in these areas.

2. Rivers and Streams

a. Recreation Activities

The Truckee River is well known for its scenic values and water-based recreation opportunities. Most recreational activities within the area are directly water-based; hiking, camping, mountain biking, bird watching, picnicking, and sightseeing are popular

activities that are indirectly linked to the river. The following water-based activities, discussed in more detail, are the most popular and are used as indicators to analyze the effects of the alternatives on the recreational resources within the study area.

(1) Fly Fishing

The Truckee River and selected tributaries have a long history of fly fishing. Before the 1930's, the river and Pyramid Lake were the only places in the world where an angler could catch 10-to-30-pound LCT. Although those days are gone ("Past Cumulative Effects"), LCT is being reintroduced into the river in hopes of establishing the species throughout the system. Fly fishing is still one of the most popular recreational uses of the river.

(2) Spin/Lure/Bait Fishing

Anglers who use spinning and casting methods to catch fish are in a separate category than fly fishers. Although some anglers who use spinning or casting methods wade in the river, they most commonly fish from shore. Because the Truckee River has different regulations for different reaches, anglers who use spinning gear, lures, and bait tend to use sections that allow these methods. Spin, lure, and bait fishing methods can be more effective at flows that are greater and less than those best suited for fly fishing.

Spin/lure/bait fishing is also popular in Donner Creek primarily because its family atmosphere appeals to the general angler. Bait anglers tend to be more oriented toward catching and keeping their limits (consumptive) than fly anglers, who tend to be more oriented toward catch and release.

(3) Rafting

From late June through early August, rafting is the most popular activity on the river. Commercial rafting (both guided and unguided) takes place on most reaches of the river downstream to Reno. Private rafters are known to use the entire river. Several of the counties license commercial outfitters, while public rafters are unregulated. Rafting does not occur on the Little Truckee River, Independence Creek, Donner Creek, or Prosser Creek.

More rafters use the upper section of the river than any other section. Rafting also takes place in the Reno/Sparks area and occasionally between Sparks and Pyramid Lake.

(4) Kayaking

Kayaking is a growing sport on the Truckee River. The river's physical characteristics make it an ideal environment for kayakers. From Class I to Class IV whitewater (depending on season and flows), the Truckee River has runs to suit the abilities of most kayakers. Although there are a few Class IV rapids (Bronco, Jaws, and Dead Man's Curve), 95 percent of the river is rated as Class II and III, which appeals to intermediate

kayakers. Kayaking does not occur on the Little Truckee River, Independence Creek, Donner Creek, or Prosser Creek. (Ratings of the rapids are discussed under "Recreation Characteristics of Stream Reaches.")

b. Recreation Characteristics of River Reaches and Streams

For purposes of this study, the Truckee River and its streams have been divided into a series of reaches, as shown on map 3.1. Each reach has unique characteristics that are attractive to different user groups and types of experiences desired, as described in the following paragraphs.

Additionally, the following narrative uses the internationally-accepted river rating classification system to describe sections of whitewater or rapids for kayakers and rafters. These ratings are designed to give boaters an approximate difficulty of a given section of river so paddlers can match their skill levels to the particular demands of the river section. This river classification is accepted on rivers throughout the world, and includes Class I (easiest) through Class VI (most difficult). Most of the Truckee River is rated Class II or III, but a few rapids (Bronco, Jaws, and Dead Man's Curve) are considered Class IV. River classifications are subjective and change with flow. The following list describes the characteristics for each class.

Class I—Easy
Fast-moving water with riffles and small waves. Few obstructions, all obvious and easily missed, with little training. Risk to swimmers is slight, and self rescue is generally easy.

Class II—Novice
Straightforward rapids with wide, clear channels, which are evident without scouting the river ahead. Occasional maneuvering may be required, but rock and medium sized waves are easily missed by trained paddlers. Swimmers are seldom injured, and group assistance, while helpful, is seldom required. Rapids at the upper end of this rating are rated as Class II +.

Class III—Intermediate
Rapids with moderate and irregular waves, which may be difficult to avoid. Complex maneuvers in fast current and good boat control in tight passages or around ledges are often required. Large waves are present but are easily avoided. Injuries while swimming are rare; self-rescue is usually easy but group assistance may be required to avoid long swims. Rapids at the upper end of this rating are rated Class III +.

Class IV—Advanced
Intense, powerful, but predictable rapids requiring precise boat handling in turbulent water. Rapids may require "must do" moves above dangerous hazards. Scouting the rapids is necessary the first time down. Risk of injury to swimmers is moderate to high, and water conditions may make self rescue difficult. Group assistance for rescue is often essential but requires practiced skills. Rapids at the upper end of this rating are rated as Class IV +.

Class V—Expert
Extremely long, violent rapids, which expose a paddler to above-average dangers. Drops may contain large, unavoidable waves and holes or steep, congested chutes with complex demanding routes. Rapids may continue for long distances between pools, demanding a high level of fitness. A very reliable "Eskimo roll," proper equipment, extensive experience, and practiced rescue skills are essential.

Class VI—Extreme
These runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability, and danger.

(1) Donner Creek: Donner Lake Dam to Truckee River
Donner Creek is a small tributary that feeds into the Truckee River just upstream of the town of Truckee. Most recreational activity occurs on the segment of creek that runs through Donner Memorial State Park. Both fly and spin/lure/ bait fishing occur from the banks. Because the creek is small, rafting and kayaking do not occur.

Following are the recreation characteristics of this creek:

- Angling occurs on this section of the creek but is not considered as good as other areas within the study area (Aukerman, et al., 1999).
- Most of the fishing is by campers who stay in the nearby campgrounds.
- Spin and bait fishing seem to be the dominant form of angling.
- Most anglers are more generalists than "expert" fly anglers.
- Most of the creek is 15-30 feet wide and can be easily fished from its banks.

(2) Prosser Creek: Prosser Creek Reservoir to Truckee River
Prosser Creek is a small stream popular with fly anglers. Many anglers visit the stream when the Truckee River becomes crowded. Prosser Creek is accessible from westbound I-80, 4 miles west of Boca Reservoir.

Following are the recreation characteristics of this creek:

- It is popular with a relatively small number of fly anglers.
- It offers a greater degree of solitude than other streams in the study area.
- It has fewer spin/lure/bait anglers because of its size and challenges offered by vegetation and access.
- There is no rafting or kayaking.

(3) Independence Creek: Independence Lake to Little Truckee River

Independence Creek is another small stream that anglers visit when the Truckee River becomes crowded. Independence Creek is fairly remote.

Following are the recreation characteristics of this creek:

- It offers a high degree of solitude.
- It is popular with fly anglers.
- It has fewer spin/lure/bait anglers because of its size and challenges offered by vegetation and access.
- There is no rafting or kayaking.

Desired flows for stream-based fishing in Independence Creek were not established.

(4) Little Truckee River: Independence Creek to Stampede Reservoir

The meadow reaches of the upper Little Truckee fish well in early summer as soon as runoff subsides. Rainbow trout from Stampede Reservoir move into the gravel bars to spawn and many remain as the water level drops. Because the creek is small, rafting and kayaking do not occur.

Following are the recreation characteristics of this section of the tributary:

- It offers high degree of solitude.
- It is becoming popular with fly anglers.
- It has fewer spin/lure/bait anglers than fly anglers because of its size and challenges offered by vegetation and access.
- There is no rafting or kayaking.

(5) Little Truckee River: Stampede Reservoir to Boca Reservoir

The reach between Stampede and Boca Reservoirs is heavily used by anglers of all types during the early spring (May and June) and after the spring runoff has subsided to 500 cfs or less. Fly and bank anglers congregate where the Little Truckee River enters Boca Reservoir because of easy access and quality fishing. Prolific insect populations and quality habitat support a highly productive fish population.

Following are the recreation characteristics of this section of the tributary:

- It has open meadows and valleys popular with fly and spin/lure/bait anglers.
- Only artificial lures with barbless hooks can be used, and the maximum size allowed to be kept is 14 inches, with a bag limit of two.
- It has a large population of fish.
- It has ample parking and access.
- There is no rafting or kayaking.

(6) Truckee River: Lake Tahoe to Donner Creek

The Truckee River begins at the outlet of Lake Tahoe at the small dam on the lake's northwest shore. This reach of river has more recreational activity than any other reach. Recreational activities are prohibited for 1,000 feet downstream from "Fanny Bridge" at the outlet. Fanny Bridge is a popular spot to view very large rainbow trout waiting for tourists to throw them a free meal as they sit in the highly oxygenated water. Unguided rafting is the most popular recreational activity. Two licensed rafting companies operate on this reach. Each is allowed 100 rafts on the water at any given time. The rafting season ranges from the middle of June through early September, depending on river temperature and flow. A public boat launch provides easy access for those with their own rafts. It is unlawful for watercraft to operate on the river if the flows exceed 1,250 cfs. The commercial rafting companies cannot send rafts out before 10 a.m. or after 4 p.m. to allow anglers a raft-free river at peak fishing times and also to reduce conflicts among different user groups on the river. Most commercial rafting companies stop renting rafts when flows are below 100 cfs.

Fishing occurs throughout the fishing season but is more popular during the early spring and fall when rafting activity has subsided. This reach of river is rated as Class I, with Class II and Class III water closer to Truckee. A bike path that parallels this reach of river has greatly increased use by bicyclists, joggers, rollerbladers, and walkers. The greatest dangers for boaters are private bridges, which have little clearance during high flows.

USFS has three campgrounds (Silver Creek, Goose Meadows, and Granite Flats) along this reach. Heavy use of this river reach can be attributed to the location of these campgrounds and easy access to the river. While most of the river is easily accessible to recreational users, many homes (especially on the eastern side of the river) and private properties are posted against trespassing.

Following are the recreation characteristics of this reach of river:

- Rafting is one of the most popular recreational activities, although both fly and spin/lure/bait fishing occur.

- Commercial rafting companies use this section of river.

- People are abundant, and solitude is not an important aspect of the recreation experience.

(7) Truckee River: Donner Creek to Little Truckee River

This reach begins at the Donner Creek confluence (Ollie's Bridge) at the southwest corner of the town of Truckee. An unimproved parking area with a capacity of about 10 vehicles is a popular access point for kayakers who wish to boat the challenging "Town Section" of the river (rated as Class III) during spring runoff. For anglers, the most popular segment of this reach parallels Glenshire Road, where many pullouts and unimproved parking areas provide easy access to the river. From Trout Creek to Gray Creek, the river is designated as "wild trout water." Both fly and spin/lure/bait fishing occur, but fly fishing is more common. The most popular times to fish this reach are April and May (before the peak spring runoff occurs) and late July through the end of the fishing season on October 15.

The segment between Glenshire Bridge and Boca Bridge is popular with recreational boaters and is rated as Class II. This 4.5-mile segment offers easy access points at both bridges. Although considered a Class II section, at greater flows (4,000 cfs), many consider it Class III. Fishing in this segment has resulted in confrontations with the San Francisco Flycasters, who own 0.5 mile of property along the river and restrict foot access. However, those floating through on watercraft are allowed to fish. Fishing becomes popular when flows are below 800 cfs in both the spring and fall. Wading is more difficult here than in other reaches of the river; consequently, spin/lure/bait fishing is more popular in this reach than fly fishing.

Prosser Creek enters the Truckee River in this reach and offers anglers (willing to walk) fine small-stream fishing. Prosser Creek at the confluence is accessible from I-80 west by turning north on an unimproved road. This area is popular among fly fishers and is known as "Joe's Schoolyard." Long, smooth runs make the area around the Prosser Creek inflow attractive to the dry fly enthusiast. Fishing in the Prosser Creek area is most popular in August and September. The Little Truckee River enters the Truckee River just before Boca Bridge and is a popular put-in point for commercial rafting companies.

Following are the recreation characteristics of this reach of river:

- It is popular with kayakers, especially during the spring.

- When flows are less, anglers replace kayakers.

- Both spin/lure/bait anglers rate this stretch of river "good" on a scale of excellent to poor (Aukerman, et al., 1999).

- The river through the town of Truckee is a popular intermediate to advanced run for kayakers.

- From the east end of Truckee to Hirshdale Bridge, fly fishing is very popular.

- Along the Truckee River from Trout Creek to the Boca Bridge, only artificial lures with barbless hooks can be used, and the minimum size fish allowed to be kept is 15 inches, with a bag limit of two.

- From Glenshire Bridge to Boca Bridge, fishing and boating are equally popular.

(8) Truckee River: Little Truckee River to State Line

This reach is the most popular with commercial rafting companies. Most outfitters put in at the Little Truckee confluence a few hundred yards from Boca Bridge and take out at Floriston. Much of this reach is Class II and III except the last 0.5 mile, which contains the Class IV Bronco and Jaws rapids. Rafting occurs when flows range from 1,000 to 4,000 cfs. Numerous rafting guides consider flows of about 2,000 cfs to be "ideal." This reach is also popular with more experienced kayakers. The area around Boca Bridge is popular with anglers because of its easy access and quality fishing.

Following are the recreation characteristics of this reach of river:

- The most heavily used reach of the Truckee River for rafting and kayaking is from Boca Bridge to Floriston.

- It is the most heavily used by commercial rafters.

- Fishing is popular, but access is limited due to the distance from the highway.

(9) Trophy

Just downstream from Floriston Bridge, where the washed out Farad diversion dam is located, is a popular spot for kayakers to "surf" and execute "rodeo" moves on the wave produced by a concrete slab from the fallen dam. Commercial and private rafters and kayakers often use this reach of river. This reach is rated as Class II, except for the portion from Farad to Verdi, which contains both Dead Man's and Staircase rapids (both considered Class IV whitewater). This reach requires three portages because of concrete diversion dams (Fleish, Steamboat Canal, and Verdi). Crystal Peak Park at the west end of Verdi is a popular recreation site that offers improved facilities and easy access to the river. Although this is not a popular put-in site for boaters, rafters and kayakers frequently pass through. Spin/lure/bait fishing is popular and productive because of many deep holes that hold trout.

Following are the recreation characteristics of this reach of river:

- It is popular with rafters and kayakers.
- Floriston to Verdi is considered more suitable for advanced river runners, with numerous Class III rapids and one Class IV rapid (Dead Man's Curve).
- Crystal Peak Park on the west side of Verdi is popular with anglers and offers good access to the river.
- Anglers have good access to the river on the east side of Verdi
- Spin/lure/bait angling is the most popular type of fishing.

(10) Mayberry, Oxbow, and Spice

These reaches are considered together because of the homogeneous characteristics of recreational use. This "urban" section of the Truckee River is easily accessible because of the many parks that line the river through downtown Reno and Sparks. Some limited rafting and kayaking occur during March, April, and May when the spring runoff begins. A kayak slalom course near Mayberry Bridge is used in the early spring and summer months. During the hot summer months, rafters occasionally use this reach to "play" in the river to beat the hot temperatures. Fishing is the most popular recreational activity. Although some fly fishing occurs, spin/lure/bait fishing is more popular. Several anglers who fish this reach say fishing is good because of the periodic stocking by NDOW. Stocking begins in March and continues through September, with rainbow trout released every 2 weeks from Sparks west to Verdi. Most fishing takes place during the late spring and summer when the flows have started to decline from the spring runoff.

Recently, Nevada's first whitewater park and kayak slalom racing course opened in this stretch of river, in the heart of the downtown Reno hotel-casino district. The whitewater course features 11 "drop pools," a slalom racing course, and more than 7,000 tons of smooth, flat rocks along the shores to aid access to the river.

Following are the recreation characteristics of this reach of river:

- Portions of this reach of river are stocked with "catchable" sized rainbow trout, increasing its popularity for fishing.
- Reno and Sparks have many river parks that allow access to the river.
- Spin/lure/bait fishing is the most popular form of fishing, although some fly fishing occurs.
- There are several kayak slalom courses established in this reach of river.
- Private raft and kayak use is more prevalent than use by commercial recreation service providers.

(11) Lockwood and Nixon

Some minimal recreational use occurs on these reaches, including spin/lure/bait fishing and rafting. From Sparks, the river flows through a hot and dry desert environment for approximately 40 miles along I-80 until it leaves the highway and enters the Pyramid Lake Indian Reservation. Because of the large amount of private property, the only river access site commonly used along I-80 is near Derby Diversion Dam.

Following are the recreation characteristics of this reach of river:

- Recreational use is much less than on other reaches of river.
- Access to the river on the Pyramid Lake Tribal lands is by permit only, which may serve to discourage some users.
- Rafting and kayaking are minor activities.

c. Desired Flows

Desired flows within the context of this recreation analysis are flows most desired by recreationists for their particular water-based activity. These are not the California Guideline flows for fish. Desired flows for fly fishing, spin/lure/bait fishing, rafting, and kayaking for this study were developed using information obtained through a study commissioned by BOR (Aukerman et al., 1999). The desired flows for the various recreation activities used in this study were derived from the average flows as recommended by professional outfitters and guides because of their extensive knowledge and experience with both professional and private recreational use of the river and their knowledge of instantaneous flows on the river.

Desired flows were used to provide a measure of the quality of a river recreation experience under the alternatives analyzed in this study. Desired flows are subjective and depend on the type of experience desired and the skill level of the user. A recreationist may still choose to participate in a given activity even if flows are less than or greater than preferred. In this case, their experience may be less than expected; however, for commercial enterprises, it is generally the goal of recreation managers to provide a setting conducive to maximizing the participant's satisfaction with the experience.

Rafters and kayakers prefer higher water conditions, which provide for more exciting and challenging runs down the river. Greater flows produce "standing waves," such as the popular "park and surf" just downstream from Floriston Bridge discussed previously. Changes in flows can increase or decrease the difficulty rating of a particular section of river. A section that is rated as Class III (such as the Boca to Floriston run) at flows above 1,500 cfs is rated as Class II at flows below 800 cfs.

Overall, anglers prefer more moderate to lower flows than rafters and kayakers. Fly anglers look for flows that allow for easy wading and access to fish-holding water, which might be in the middle of the river, and obstructions that hold trout. Although not

necessary, wading increases a fly angler's enjoyment and success rate. Greater flows also limit commercial guiding opportunities because increased flows may be dangerous for inexperienced anglers. Some guides will not take clients on the river when high flows create an unacceptable risk. Bank anglers tend to be less particular about flow levels because they do not need to enter the river. However, flows that rapidly increase or decrease adversely affect success rates of both groups of anglers.

Table 3.85 presents the range of desired flows for these stream-based recreation activities for the river reaches used in this analysis. (See the Economics and Recreation Appendix for further information on development of desired flows.)

Table 3.85—Desired flows (cfs) for stream-based recreation in the Truckee River basin

Reach	Fly fishing	Spin/lure/bait fishing	Rafting	Kayaking
Donner Creek: Donner Lake to Truckee River	40-70	40-70	Not applicable	Not applicable
Prosser Creek: Prosser Creek Reservoir to Truckee River	40-70	40-70	Not applicable	Not applicable
Independence Creek: Independence Lake to Little Truckee River	No data	No data	Not applicable	Not applicable
Little Truckee River: Independence Creek to Stampede Reservoir	40-70	40-70	Not applicable	Not applicable
Little Truckee River: Stampede Reservoir to Boca Reservoir	100-250	200-500	Not applicable	Not applicable
Truckee River: Lake Tahoe to Donner Creek	350-600	350-800	400	1,000
Truckee River: Donner Creek to Little Truckee River confluence	400-500	400-800	900-1,200	900-1,200
Truckee River: Little Truckee River to State line	400-500	400-800	900-1,200	1,000-1,200
Trophy	500-700	500-600	2,000-4,000	2,000-4,000
Mayberry, Oxbow, Spice	500-800	600-800	2,000-4,000	2,000-4,000
Lockwood, Nixon	1,000-1,500	1,000-3,000	1,000-3,000	1,000-3,000

II. Environmental Consequences

A. Introduction

Modifying operations of Truckee River reservoirs could affect lake and reservoir elevations and the quality, quantity, timing, and duration of flows. In turn, these changes could affect water-based recreation activities in the study area. This analysis evaluated the effects of changes in elevations and flows on water-based recreation using the following indicators:

- Lake- and reservoir-based recreation:
    - Seasonal recreation visitation (as measured by overnight and day use visitors correlated to reservoir elevation and reservoir surface area)
    - Boat ramp usability (as measured by water surface elevation from April through October)
    - Effects of fluctuating elevation on use of stationary docks at Donner Lake
- Stream-based recreation:
    - Suitability of flows for stream fishing during the recreation season (fly fishing and spin/lure/bait fishing) (as measured by number of months that desired flows occur)
    - Suitability of flows for rafting during the recreation season (as measured by number of months that desired flows occur)
    - Suitability of flows for kayaking during the recreation season (as measured by number of months that desired flows occur)

B. Summary of Effects

Analysis of operations model results, in general, shows the following:

Visitation at Prosser Creek, Stampede, and Boca Reservoirs generally would be greater under TROA than under No Action and current conditions, primarily because annual average water elevations would be higher under TROA, thus enhancing recreational access and ensuring a higher quality recreational experience. Visitation at Donner Lake would be negligibly (less than 1 percent) less under TROA than under current conditions, but greater than under either No Action or LWSA.

Effects on boat ramp usability would be the same in all hydrologic conditions at Pyramid Lake and Prosser Creek and Lahontan Reservoirs under TROA, LWSA, and No Action. Boat ramps would be more usable in median hydrologic conditions at Donner Lake; in dry hydrologic conditions at Stampede Reservoir, and in wet hydrologic conditions at Boca Reservoir under TROA than under No Action and LWSA. Boat ramps would be less usable in dry hydrologic conditions at Donner Lake and in median hydrologic conditions at Boca Reservoir under TROA than under No Action. Usability of stationary docks at Donner Lake would not be significantly affected under any alternative in June, July, or August.

Effects on flows for fly fishing, rafting, and kayaking would be minimal under No Action, LWSA, and TROA. Because of the nature of spin/lure/bait fishing, and because anglers can and will still pursue their sport when flows are either greater or less than preferred, none of the effects on flows under any of the alternatives is considered significant.

Table 3.86 summarizes the effects of the alternatives on water-based recreation.

C. Lake- and Reservoir-Based Recreation Visitation

1. Method of Analysis

Differences in seasonal recreation visitation at lakes and reservoirs were quantified by the number of overnight and day use visitors during the recreation season compared to changes in reservoir surface acres during the same period. Recreation model results (described in "Economic Environment) were used to determine numbers of overnight and day use visitors. Recreation visitation used in this analysis reflects only recreation that occurs during the 7-month prime recreation season, April through October. Therefore, recreation visitation shown in this section is less than that shown in the analysis of the economic environment, which considers the entire year. Operations model results were used to determine reservoir surface acres.

Boat ramp usability was quantified as the percent of the recreation season that reservoir elevation equaled or exceeded the elevation suitable for launching large and mid-sized watercraft. Elevations were generated by the operations model. Note that boat ramp usability is not absolute because it depends on a number of factors, such as the type of watercraft, slope of the boat ramp, lake or reservoir bottom structure at the toe of the ramp, and emergence of potential hazards, such as large rocks or stumps.

Stationary dock use at Donner Lake was quantified as the number of draw downs between elevations 5931.5 and 5935.5 feet in June, July, and August, as shown by operations model results.

Lahontan Reservoir was not included in the study that established a relation between visitation and changes in upper Truckee basin reservoir surface acres. Therefore, operations model results were used to calculate likely recreation use at Lahontan

Table 3.86—Summary of effects on water-based recreation

Indicator	Current conditions	No Action	LWSA	TROA
Seasonal recreation visitation	Recreational visitation varies among hydrologic conditions at all reservoirs, with greatest losses in visitation occurring in dry hydrologic conditions. Visitation losses occur in median hydrologic conditions, but losses are not as great as in dry hydrologic conditions	Same as under current conditions, except slightly less at Donner Lake in median hydrologic conditions	Same as under No Action, except slightly more at Donner Lake in median hydrologic conditions	Same as under No Action, except more at Donner Lake and Prosser Creek, Stampede, and Boca Reservoirs in some hydrologic conditions
Boat ramp usability	Boat ramps are unusable from 0 to 100 percent of the recreation season, depending on lake or reservoir and hydrologic condition. Boat ramps are unusable the greatest number of months in dry hydrologic conditions at Prosser Creek Reservoir; ramps are usable the greatest number of months at Stampede Reservoir in wet and median hydrologic conditions	Same as under current conditions, except slightly more usable at Boca Reservoir in wet hydrologic conditions	Same as under No Action	Same as under No Action, except slightly more or less usable at Donner Lake and Boca Reservoir in certain hydrologic conditions
Suitability of flows for fly fishing	Flows are suitable 71 to 0 percent of the recreation season, depending on location and hydrologic condition. The Lake Tahoe release section of the river offers the greatest number of months of suitable flows	Same as under current conditions, with a few exceptions	Same as under No Action	Same as under No Action

Table 3.86—Summary of effects on water-based recreation – continued

Indicator	Current conditions	No Action	LWSA	TROA
Suitability of flows for spin/lure/bait fishing	Flows are suitable 86 to 0 percent of the recreation season, depending on location and hydrologic condition. The Lake Tahoe release section of the river offers the greatest number of months of suitable flows	Desired flows would occur more often in the Little Truckee River from Independence Creek to Stampede Reservoir and in the Trophy reach in wet hydrologic conditions and less often in the Mayberry, Oxbow, and Spice reaches in dry hydrologic conditions than under current conditions	Same as under No Action, except desired flows would occur more often in the Mayberry, Oxbow, and Spice reaches in median hydrologic conditions.	Desired flows would occur more often in Prosser Creek in median hydrologic conditions and in the Mayberry, Oxbow, and Spice reaches in wet hydrologic conditions and less often in several reaches, primarily in wet hydrologic conditions, than under No Action and current conditions
Suitability of flows for rafting	Flows are suitable 43 to 0 percent of the recreation season, depending on location and hydrologic condition. The Trophy section of the river offers the greatest number of months of suitable flows	Same as under current conditions	Same as under No Action	Same as under No Action, except that desired flows would occur less often in the Truckee River from Lake Tahoe to Donner Creek in wet hydrologic conditions and more often in the Mayberry, Oxbow, and Spice reaches in wet hydrologic conditions
Suitability of flows for kayaking	Flows are suitable 86 to 0 percent of the recreation season, depending on location and hydrologic condition. The Lake Tahoe release section of the river offers the greatest number of months of suitable flows.	Same as under current conditions	Same as under No Action	Same as under No Action, except that desired flows would occur less often in the Truckee River from Lake Tahoe to Donner Creek in wet hydrologic conditions and more often in the Mayberry, Oxbow, and Spice reaches in wet hydrologic conditions.

Reservoir based on the average surface acreage available during the recreation season in wet, median, and dry hydrologic conditions; inferences were drawn regarding recreationist response to surface acres available, e.g., when mud flats develop, the quality of the fishing experience decreases and fewer recreationists are attracted to the area.

2. Threshold of Significance

This section identifies thresholds of significance for recreation visitation, boat ramp usability, and use of stationary docks at Donner Lake.

a. Recreation Visitation

Analysis of recreation and operations model results, in general, shows that as elevation declines, the number of visitors decline. It is difficult, however, to identify a point at which declining number of visitors becomes significant, because for some recreationists, fewer visitors translates into a higher quality recreation experience. A better indicator of the significance of declining visitation is the economic impact realized from fewer visitor expenditures. (See "Economic Environment" for the economic significance of declining visitation.).

As visitor numbers decline, there is less competition for available facilities and services, enhancing the experience for some visitors. However, a declining user population can prompt resource management agencies to reallocate capital investments and services to areas with greater visitation. Therefore, visitors accustomed to certain levels of facilities and services might find that as visitation declines, they will have fewer fish to catch or restrooms and boat launch facilities to use. The visitation level at which agencies would consider reallocating capital investments and services cannot be readily quantified.

b. Boat Ramp Usability

The effect of operations on the reservoir and lake elevations becomes significant when watercraft can no longer be launched from boat ramps. For the purpose of this analysis, it was assumed that significant effects occur when water levels reach the toe or base of the ramp, thus rendering the ramp totally unusable and making the launch of all but small, portable watercraft impractical. However, a second threshold was used for analyzing overall boat ramp usability. For the second analysis, it was assumed that large- and mid-sized watercraft generally cannot be safely launched when there is less than 3 feet of water on the mid or lower portion of the ramp. However, some smaller watercraft can be launched. Therefore, at these lower elevations, a boat ramp was considered "less than fully usable" but not completely unusable. However, when reservoir elevations fall below the bottom of the boat ramps and the ramps become unusable, the length of the existing boat ramps could be extended where topography allows. If extending the existing ramp is impractical due to terrain or other environmental concerns, it may be possible to relocate the boat ramp.

c. Stationary Dock Use at Donner Lake

An effect on stationary dock use at Donner Lake was considered significant if the elevation was below 5934 feet. As discussed previously, stationary dock use at Donner Lake was analyzed using operations model results to show the number of draw downs between elevation 5935.5 and 5932.5 feet in June, July, and August. Only these months were analyzed because dam safety requirements specify that the discharge gates of the dam be held open from November 15 through April 15 to prevent the lake from exceeding elevation 5926.9 feet, and draw downs may occur in September and October in anticipation of opening the discharge gates to meet this requirement. Furthermore, the 1943 Donner Lake Indenture directs that elevation of Donner Lake not be allowed to fall below 5932 feet in June, July, and August, except to meet minimum flow requirements. (See chapter 2).

3. Model Results

Table 3.87 presents seasonal recreation visitation; table 3.88 presents the percent of the recreation season that boat ramps are unusable ("high and dry"); table 3.89 presents the percent of the recreation season that boat ramps are usable for large- and mid-sized watercraft; table 3.90 presents average surface acres at Lahontan Reservoir; and table 3.91 presents the number of draw downs between elevation 5935.5 and 5932.5 feet in June, July, and August at Donner Lake. Elevations below 5934 feet are not acceptable for stationary dock use.

Table 3.87—Seasonal recreation visitation (as measured by the number of overnight visitors and day use visitors from April through October)

Lake/reservoir	Hydrologic condition	Current conditions	No Action	LWSA	TROA
Donner	Wet	127,626	127,643	127,643	127,578
	Median	123,566	116,939	97,821	118,324
	Dry	98,781	98,788	98,788	98,534
Prosser Creek	Wet	20,600	20,640	20,640	21,369
	Median	18,519	18,928	21,032	20,031
	Dry	8,738	10,710	10,801	14,612
Stampede	Wet	71,383	71,398	71,368	71,414
	Median	69,019	68,703	71,194	71,136
	Dry	15,642	15,852	15,838	39,989
Boca	Wet	29,716	29,740	29,744	29,454
	Median	24,976	24,844	25,034	25,874
	Dry	8,883	8,739	8,724	10,992

Table 3.88—Percent of the recreation season boat ramps are unusable ("high and dry")

Lake/reservoir	Hydrologic condition	Current conditions	No Action	LWSA	TROA
Donner	Wet	0	0	0	0
	Median	0	0	0	0
	Dry	0	0	0	0
Prosser Creek	Wet	0	0	0	0
	Median	0	0	0	0
	Dry	86	100	71	28
Stampede	Wet	0	0	0	0
	Median	0	0	0	0
	Dry	100	100	100	0
Boca	Wet	14	0	14	14
	Median	42	42	42	42
	Dry	100	100	100	100
Lahontan	Wet	0	0	0	0
	Median	0	0	0	0
	Dry	42	42	42	42
Pyramid	Wet	0	0	0	0
	Median	0	0	0	0
	Dry	0	0	0	0

Table 3.89—Percent of the recreation season boat ramps are usable for large and mid-sized watercraft

Lake/reservoir	Hydrologic condition	Current conditions	No Action	LWSA	TROA
Donner	Wet	71	71	71	71
	Median	57	57	57	71
	Dry	57	57	57	42
Prosser Creek	Wet	86	86	86	86
	Median	86	86	86	86
	Dry	0	0	0	28
Stampede	Wet	100	100	100	100
	Median	100	100	100	100
	Dry	0	0	0	100
Boca	Wet	57	71	71	86
	Median	57	57	57	43
	Dry	0	0	0	0
Lahontan	Wet	100	100	100	100
	Median	100	100	100	100
	Dry	57	57	57	57
Pyramid	Wet	100	100	100	100
	Median	100	100	100	100
	Dry	100	100	100	100

Table 3.90—Average surface acres at Lahontan Reservoir from April through October

Hydrologic condition	Current conditions	No Action	LWSA	TROA
Wet	12,444	12,520	12,529	12,520
Median	6,702	6,604	6,600	6,588
Dry	4,207	3,673	3,659	3,651

Table 3.91—Stationary dock use at Donner Lake number of draw downs between elevation 5935.5 and 5932.5 feet in June, July, and August

Elevation (feet)	Current conditions	No Action	LWSA	TROA
June				
5935.5	22	22	22	24
5935.0	17	17	17	19
5934.5	10	10	10	13
5934.0	5	5	5	7
5933.5	2	2	2	4
5933.0	1	1	1	1
5932.5	0	0	0	0
5932.0	0	0	0	0
5931.5	0	0	0	0
July				
5935.5	37	37	37	53
5935.0	20	20	20	30
5934.5	16	16	16	21
5934.0	12	12	12	17
5933.5	8	8	8	8
5933.0	3	3	3	4
5932.5	1	1	1	1
5932.0	0	0	0	0
5931.5	0	0	0	0
August				
5935.5	81	81	81	92
5935.0	41	41	41	62
5934.5	24	24	24	48
5934.0	19	19	19	30
5933.5	13	13	13	21
5933.0	10	10	10	11
5932.5	6	6	6	7
5932.0	2	2	2	2
5931.5	0	0	0	0

4. Evaluation of Effects

a. No Action

(1) Donner Lake

Recreation model results show about the same number of visitors at Donner Lake under No Action and current conditions in wet and dry hydrologic conditions. The greatest difference occurs in median hydrologic conditions, when, under No Action, there are 6,627 fewer visitors than under current conditions, or 5 percent less, a minor difference, but it could have the following effect:

- Enhanced recreation experience for users that place a high value on solitude
- Reallocation of capital investments and services to areas with greater visitation

Operations model results show that, under No Action, boat ramp usability at Donner Lake is the same as under current conditions in all hydrologic conditions.

For stationary docks at Donner Lake, operation model results show the same number of draw downs between elevation 5935.5 and 5932.5 feet in June, July, and August under both No Action and current conditions.

(2) Prosser Creek Reservoir

Under No Action, recreation model results show 409 more visitors at Prosser Creek Reservoir than under current conditions in median hydrologic conditions, or about 2 percent more, which would have negligible effect. In wet hydrologic conditions, model results show even less difference between No Action and current conditions (40), or less than a 1-percent difference, and would have negligible effect. In dry hydrologic conditions, recreation model results show 1,972 fewer visitors than under current conditions (18 percent less), which could have the following effects:

- Fewer impacts on private landowners within upland areas surrounding the reservoir because of fewer visitors.
- Less competition among recreationists for use of the recreational resources and facilities, although the recreation experience would likely be highly diminished because of low water.
- Displacement of visitors to other destinations within the study area, increasing the burden on the operational resources of those areas. Additionally, recreationists gathering where suitable water exists could result in crowding and increased pressure on those resources.

Operations model results show that boat ramps at Prosser Creek Reservoir are fully usable 100 percent of the recreation season in wet and median hydrologic conditions under No Action compared to 86 percent of the season under current conditions. In dry hydrologic conditions, operations model results show that boat ramps are unusable throughout the recreation season under both No Action and current conditions. As a result, boat launching could be difficult because of low water conditions. Visitors could experience bottom and propeller damage. Additionally, site managers could have increased maintenance costs associated with a higher incidence of damage to the boat ramp surface and increased eroding of rock, soil, and gravel at the toe of the ramp.

(3) Stampede Reservoir

Under No Action, recreation model results show 15 fewer visitors at Stampede Reservoir in wet hydrologic conditions, 316 fewer visitors in median hydrologic conditions, and 210 more visitors in dry hydrologic conditions than under current conditions. In all cases, this is less than a 1 percent difference and would have negligible effect.

Operations model results show that boat ramp usability at Stampede Reservoir under No Action is the same as under current conditions: boat ramps are fully usable 100 percent of the recreation season in wet and median hydrologic conditions and less than fully usable in dry hydrologic conditions.

(4) Boca Reservoir

Recreation model results show less than a 1 percent difference in the number of visitors at Boca Reservoir between No Action and current conditions, which would have negligible effect.

Operations model results show that boat ramp usability at Boca Reservoir under No Action is about the same as under current conditions. In wet hydrologic conditions, boat ramps are usable 71 percent of the recreation season under No Action compared to 57 percent under current conditions. Under both No Action and current conditions, boat ramps are usable 57 percent of the season in median hydrologic conditions and unusable throughout the recreation season in dry hydrologic conditions.

Therefore, the following effects could occur:

- Diminished recreation experience in August, September, and October in median hydrologic conditions because of difficult boat launching

- Diminished recreation experience throughout the recreation season in dry hydrologic conditions because of difficult boat launching

- Increased maintenance costs associated with a higher incidence of damage to the boat ramp surface and increased eroding of rock, soil, and gravel at the toe of the ramp

(5) Lahontan Reservoir

Operations model results show that, under No Action, average surface acres are about the same as under current conditions in all three hydrologic conditions; as a result, the number of recreationists likely would be about the same. Boat ramp usability is the same as under current conditions.

b. LWSA

(1) Donner Lake

Recreation model results show about the same number of visitors at Donner Lake under LWSA, No Action, and current conditions in wet and dry hydrologic conditions.

However, in median hydrologic conditions, under LWSA, there are 19,118 fewer visitors than under No Action in median hydrologic conditions, or approximately 16 percent less, and 25,745 fewer visitors than under current conditions, or approximately 26 percent less. As a result, the following effects could occur in median hydrologic conditions:

- Enhanced recreation experience for visitors seeking solitude because of less crowding and competition for available facilities and services.

- Displacement of visitors to other destinations, increasing the burden on the operational resources of those areas. Additionally, recreationists gathering where suitable water exists could result in crowding and increased pressure on those resources.

- Reallocation of capital investments and services to areas with greater visitation. Fewer impacts on private landowners within upland areas surrounding the reservoir because of fewer visitors.

Operations model results show that boat ramp usability is virtually the same under LWSA, No Action and current conditions: boat ramps are fully usable 71 percent of the recreation season in median hydrologic conditions and fully usable about 57 percent of the season in median and dry hydrologic conditions. However, in all three cases, boat ramps are less than fully usable in April, September, and October, when visitation is much less. Therefore, effects would be much less than if the boat ramps were not fully usable in the prime recreation months of June, July, and August.

For stationary docks at Donner Lake, operation model results show the same number of draw downs between elevation 5935.5 and 5932.5 feet in June, July, and August under LWSA, No Action, and current conditions. Elevations of less than 5934 feet seldom occur. Thus, effects on stationary docks at Donner Lake would be relatively minor.

(2) Prosser Creek Reservoir

Under LWSA, recreation model results show the same number of visitors at Prosser Creek Reservoir as under No Action and 40 fewer than under current conditions in wet hydrologic conditions, or less than a 1 percent difference, which would have negligible effect.

In median hydrologic conditions, under LWSA, there are 1,104 more visitors than under No Action and 1,513 more than under current conditions, or about 7 percent more in both cases.

In dry hydrologic conditions, under LWSA, there are 91 more visitors than under No Action, and 2,063 more than under current conditions, or less than 1 percent more than under No Action and 19 percent more than under current conditions.

As a result, the following effects could occur under LWSA in dry hydrologic conditions:

- Diminished recreation experience for users that place a high value on solitude
- Greater impacts on private landowners within upland areas surrounding the reservoir because of increased incidents of trespass and other impacts resulting from more visitors
- Increased burden on operational resources of managing agencies because of greater visitation

Operations model results show that in wet hydrologic conditions, boat ramps are usable 86 percent of the recreation season under the LWSA, 14 percent less than under No Action and the same as under current conditions.

In median hydrologic conditions, boat ramps are usable 86 percent of the recreation season—the same as under No Action and 28 percent more than under current conditions. In dry hydrologic conditions, boats ramps are less than fully usable throughout the recreation season under LWSA, No Action, and current conditions. Thus, the effects in dry hydrologic conditions would be the same as under No Action.

(3) Stampede Reservoir

Under LWSA, recreation model results show 30 fewer visitors at Stampede Reservoir than under No Action and 15 more than under current conditions in wet hydrologic conditions, or less than a 1 percent difference in both cases, which would have negligible effect.

In median hydrologic conditions, under LWSA, there are 2,491 more visitors than under No Action and 2,175 more than under current conditions, or a 3 percent difference in both cases, which would have negligible effect.

In dry hydrologic conditions, under LWSA, there are 14 more visitors than under No Action and 196 more than under current conditions, or about a 1 percent difference in both cases, and which would little consequence in terms of differences between alternatives or effects on the recreational resource.

Operations model results show that boat ramp usability at Stampede Reservoir is the same under LWSA, No Action, and current conditions. Thus, the effects would be the same as under No Action.

(4) Boca Reservoir

Under LWSA, recreation model results show 4 more visitors at Boca Reservoir than under No Action and 28 fewer visitors than under current conditions in wet hydrologic conditions; 190 more than under No Action and 58 more than under current conditions in median hydrologic conditions; and 15 fewer under than under No Action and 159 fewer than under current conditions in dry hydrologic conditions. Each of these differences is less than 1 percent and would have negligible effect.

Operations model results show that boat ramp usability under LWSA is the same as under No Action or current conditions. Thus, the effects would be the same as under No Action.

(5) Lahontan Reservoir

Operations model results show that, under LWSA, average surface acres are about the same as under No Action or current conditions in all three hydrologic conditions; as a result, the number of recreationists likely would be about the same. Boat ramp usability is the same as under No Action and current conditions.

c. TROA

(1) Donner Lake

Recreation model results show 125 fewer visitors at Donner Lake under TROA than under No Action and 108 more than under current conditions in wet hydrologic conditions; 1,385 more than under No Action and 5,242 more than under current conditions in median hydrologic conditions; and 254 fewer than under No Action and 247 fewer than under current conditions in dry hydrologic conditions. In all cases, the differences are less than 4 percent and would have negligible effect.

Operations model results show that boat ramps are usable 71 percent of the recreation season under TROA, No Action, and current conditions in wet hydrologic conditions; usable 71 percent of the season under TROA compared to 57 percent of the season under

No Action and current conditions in median hydrologic conditions; and usable 71 percent of the season under TROA compared to 43 percent of the season under both No Action and current conditions in dry hydrologic conditions.

Thus, the following effects could occur:

- Same effect as under No Action in wet hydrologic conditions.
- Minimal disruption to boaters in median hydrologic conditions, because boat ramps would be more usable under TROA than under current conditions or the other alternatives. Moreover, under TROA, boat ramps would be less than fully usable in April and October, when usage is lowest.
- Better conditions for boaters in dry hydrologic conditions under TROA than under No Action or current conditions, because boat ramps would be usable in two more months.
- Diminished recreation experience when boat ramps less than fully usable because of difficulties with launching large- and mid-sized watercraft.
- Increased maintenance costs when boat ramps less than fully usable associated with a higher incidence of damage to the boat ramp surface and increased eroding of rock, soil, and gravel at the toe of the ramp.

For stationary docks at Donner Lake, operation model results show slightly more draw downs between elevation 5935.5 and 5932.5 feet in June, July, and August under TROA than under either No Action or current conditions. As the elevation drops below 5934 feet, however, draw downs occur less frequently under TROA. Overall, effects on stationary docks at Donner Lake would be minor under TROA.

(2) Prosser Creek Reservoir

Recreation model results show 729 more visitors at Prosser Creek Reservoir under TROA than under No Action and 769 more visitors than under current conditions in wet hydrologic conditions, a difference of about 3 percent in both cases, which would have negligible effect.

In median hydrologic conditions, there are 1,103 more visitor under TROA than under No Action and 1,512 more than under current conditions, differences of 5 and 7 percent, respectively.

In dry hydrologic conditions, there are 3,902 more visitors under TROA than under No Action and 5,874 more visitors than under current conditions, or 27 and 40 percent more, respectively. Potential effects of these differences follow. Dry hydrologic conditions are often temporary, so the following effects would most likely be temporary as well:

- Diminished recreation experience for users that place a high value on solitude
- Diminished recreation experience because of increased competition for the use of available services and facilities
- Possibly more and better services and facilities in response to higher visitation

Operations model results show that boat ramp usability is the same under TROA as under No Action and current conditions. Therefore, the effects would be the same as under No Action.

(3) Stampede Reservoir

Recreation model results show 16 more visitors at Stampede Reservoir under TROA than under No Action and 31 more than under current conditions in wet hydrologic conditions; 2,433 more than under No Action and 2,117 more visitors than under current conditions in median hydrologic conditions. In all cases, these differences are less than 3 percent and would have negligible effect.

However, in dry hydrologic conditions, recreation model results show 24,137 more visitors under TROA than under No Action and 24,347 more than under current conditions, or approximately 60 percent more in both cases. Thus, the following effects could occur in dry hydrologic conditions:

- Existing facilities would be sufficient to prevent crowding and overuse
- Capital investments and services could be reallocated to areas with greater visitation, resulting in an overall decrease in services and facilities, and, thus, adversely affecting the recreation experience

Operations model results show that boat ramp usability is the same under TROA, No Action, and current conditions. Thus, the effects would be the same as under No Action.

(4) Boca Reservoir

Recreation model results show 286 fewer visitors at Boca Reservoir under TROA than under No Action and 262 fewer than under current conditions in wet hydrologic conditions; 1,030 more than under No Action and 898 more than under current conditions in median hydrologic conditions; and 253 more than under No Action and 109 more than under current conditions and in dry hydrologic conditions. In all cases, this is less than a 3 percent difference and would have negligible effect.

In wet hydrologic conditions, operation model results show that boat ramps are 86 percent of the recreation season under TROA, compared to 71 percent under No Action and 57 percent under current conditions. Thus, boaters would have better access under TROA in wet hydrologic conditions.

In median hydrologic conditions, boat ramps are usable 57 percent of the recreation season under both No Action and current conditions but usable only 43 percent of the recreation season under TROA. The effect would be minor, however, because the boat ramps would be unusable mostly in lower use months, such as September and October.

In dry hydrologic conditions, operation model results show that boat ramps could be less than usable throughout the recreation season under all alternatives.

(5) Lahontan Reservoir

Operations model results show that average surface acres are about the same under TROA as under No Action and current conditions in all three hydrologic conditions; as a result, the number of recreationists likely would be about the same. Boat ramp usability is the same as under No Action and current conditions.

5. Mitigation

No mitigation would be required because no significant effects would occur under any of the alternatives.

D. Stream-Based Recreation

1. Method of Analysis

Suitability of flows for fly fishing, spin/lure/bait fishing, rafting and kayaking were quantified by determining the number of months with desired flows for each activity during the recreation season.

Desired flows were established through interviews and statistical surveys of actual river users engaged in each particular activity (Auckerman, et al., 1999). Note, however, that users may still elect to participate in a given activity even if flows are not within desired ranges. In other words, anglers may still fish although flows are either low or high. The nature of water-based recreation is that as long as there is water, some percentage of the user population will still participate in that activity. The highly engaged enthusiast may elect to go somewhere else if elevations are too high or too low during the 7-month recreation season, but the casual user may still participate in the activity, if not for the particular experience they are seeking, then for some other reason, such as enjoying the scenic setting. For this reason, the model results should not be viewed as absolutes but rather indicators of trends of recreational use.

River users were asked to identify flows that were higher than desired, desired, or were less than desired (in cfs) for their activity. These survey data were then averaged to determine flow preferences. These averaged flows were then compared to flows for reaches of river and streams (map 3.1) generated by the operations model for three

hydrologic conditions—wet, median, and dry (i.e., hydrologic conditions with 10-, 50- and 90-percent exceedences)—for the 7-month recreation season under current conditions, No Action, LWSA, and TROA.

Table 3.92 shows the percentage of survey respondents that indicated either high or low flows would prevent them from using the river.

Table 3.92—Percentage of survey respondents that indicated either high or low flows would prevent them from using the river

Activity	Percentage who said low flow would stop use	Percentage who said high flow would stop use
Fly fishing	24	76
Spin/lure/bait fishing	34	66
Kayaking	92	8
Rafting	84	16

2. Threshold of Significance

For stream-based recreation, an effect was considered significant when flows (either high or low) would prevent participants from pursuing their activity.

3. Model Results

Tables 3.93 through 3.96 present operations model results for the number of months various flows occur in the 7-month recreation season in wet, median, and dry hydrologic conditions under current conditions, No Action, LWSA, and TROA. The relation of the flows to desired flows for fly fishing, spin/lure/bait fishing, rafting, and kayaking is shown. Note that reservoirs are not operated to achieve desired flows unless they coincide with Floriston Rates; achievement under any alternative or current conditions would be happenstance.

4. Evaluation of Effects

a. No Action

(1) Donner Creek: Donner Lake Dam to Truckee River

Operations model results show the same flows for fly fishing under No Action and current conditions. Desired flows occur only in median hydrologic conditions; flows are either greater or less than desired throughout the recreation season in all other hydrologic conditions. Fly fishing is a minor activity on this stream.

**Table 3.93—Fly fishing –
Number of months various flows occur in 7-month recreation season**

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Donner Creek: Donner Lake to Truckee River	Wet	> = <	5 0 2	5 0 2	5 0 2	4 0 3
	Median	> = <	1 2 4	1 2 4	1 2 4	1 2 4
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Prosser Creek: Prosser Creek Reservoir to Truckee River	Wet	> = <	6 0 1	6 0 1	6 0 1	6 1 0
	Median	> = <	5 0 2	4 1 2	4 1 2	4 2 1
	Dry	> = <	0 0 7	0 0 7	0 1 6	0 0 7
Independence Creek: Independence Lake to Little Truckee River	Wet	>=<	Not applicable	Not applicable	Not applicable	Not applicable
	Median	>=<	Not applicable	Not applicable	Not applicable	Not applicable
	Dry	>=<	Not applicable	Not applicable	Not applicable	Not applicable
Little Truckee River: Independence Creek to Stampede Reservoir	Wet	>=<	2 2 3	2 2 3	2 2 3	2 2 3
	Median	>=<	0 2 5	0 2 5	0 2 5	0 2 5
	Dry	>=<	0 0 7	0 0 7	0 0 7	0 0 7
Little Truckee River: Stampede Reservoir to Boca Reservoir	Wet	>=<	5 1 1	4 2 1	4 2 1	1 4 2
	Median	>=<	3 1 3	3 2 2	3 2 2	1 4 2
	Dry	>=<	0 0 7	0 0 7	0 0 7	0 0 7

**Table 3.93—Fly fishing –
Number of months various flows occur in 7-month recreation season – continued**

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Truckee River: Lake Tahoe to Donner Creek	Wet	>	1	1	1	1
		=	5	5	5	2
		<	1	1	1	4
	Median	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
Truckee River: Donner Creek to Little Truckee River confluence	Wet	>	4	4	4	4
		=	2	2	2	0
		<	1	1	1	3
	Median	>	3	3	3	3
		=	0	0	0	0
		<	4	4	4	4
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7
Truckee River: Little Truckee River to State line	Wet	>	7	7	7	6
		=	0	0	0	1
		<	0	0	0	0
	Median	>	6	6	6	5
		=	1	1	1	2
		<	0	0	0	0
	Dry	>	4	5	4	3
		=	1	1	1	2
		<	2	1	2	2
Trophy	Wet	>	4	5	5	4
		=	3	2	2	2
		<	0	0	0	1
	Median	>	3	3	3	3
		=	2	3	3	2
		<	2	1	1	2
	Dry	>	1	3	1	1
		=	3	3	3	3
		<	3	1	3	3
Mayberry, Oxbow, Spice	Wet	>	3	3	3	3
		=	2	2	2	2
		<	2	2	2	2
	Median	>	3	2	2	2
		=	0	1	1	1
		<	4	4	4	4
	Dry	>	0	0	0	0
		=	1	1	1	1
		<	6	6	6	6

**Table 3.93—Fly fishing –
Number of months various flows occur in 7-month recreation season – continued**

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Lockwood, Nixon	Wet	> = <	3 0 4	3 0 4	3 0 4	3 0 4
	Median	> = <	0 1 6	0 1 6	0 1 6	0 1 6
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7

**Table 3.94—Spin/lure/bait fishing –
Number of months various flows occur in 7-month recreation season**

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Donner Creek: Donner Lake to Truckee River	Wet	> = <	4 1 2	6 0 1	5 0 2	4 0 3
	Median	> = <	1 2 4	1 2 4	1 2 4	1 2 4
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Prosser Creek: Prosser Creek Reservoir to Truckee River	Wet	> = <	6 0 1	6 0 1	6 0 1	6 1 0
	Median	> = <	5 0 2	4 1 2	4 1 2	4 2 1
	Dry	> = <	0 0 7	0 1 6	0 1 6	0 0 7
Independence Creek: Independence Lake to Little Truckee River	Wet	> = <	Not applicable	Not applicable	Not applicable	Not applicable
	Median	> = <	Not applicable	Not applicable	Not applicable	Not applicable
	Dry	> = <	Not applicable	Not applicable	Not applicable	Not applicable

**Table 3.94—Spin/lure/bait fishing –
Number of months various flows occur in 7-month recreation season – continued**

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Little Truckee River: Independence Creek to Stampede Reservoir	Wet	> = <	4 2 1	4 2 1	4 2 1	4 2 1
	Median	> = <	3 1 3	3 1 3	3 1 3	3 1 3
	Dry	> = <	2 1 4	2 1 4	2 1 4	2 1 4
Little Truckee River: Stampede Reservoir to Boca Reservoir	Wet	> = <	3 2 2	3 2 2	3 2 2	2 3 2
	Median	> = <	0 3 4	0 3 4	0 3 4	0 3 4
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Truckee River: Lake Tahoe to Donner Creek	Wet	> = <	0 6 1	0 6 1	0 6 1	1 2 4
	Median	> = <	0 0 7	0 0 7	0 0 7	0 0 7
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Truckee River: Donner Creek to Little Truckee River confluence	Wet	> = <	3 3 1	3 3 1	3 3 1	3 1 3
	Median	> = <	0 3 4	0 3 4	0 3 4	1 2 4
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Truckee River: Little Truckee River to State line	Wet	> = <	4 3 0	4 3 0	4 3 0	4 3 0
	Median	> = <	3 4 0	3 4 0	3 4 0	3 4 0
	Dry	> = <	0 5 2	0 5 2	0 5 2	0 5 2

**Table 3.94—Spin/lure/bait fishing –
Number of months various flows occur in 7-month recreation season – continued**

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Trophy	Wet	> = <	6 1 0	5 2 0	5 2 0	5 1 1
	Median	> = <	3 2 2	3 3 1	3 3 1	3 2 2
	Dry	> = <	1 2 4	1 2 4	2 2 3	1 2 4
Mayberry, Oxbow, Spice	Wet	> = <	3 2 2	3 2 2	3 2 2	3 1 3
	Median	> = <	3 0 4	2 1 4	2 1 4	2 1 4
	Dry	> = <	0 1 6	0 0 7	0 0 7	0 0 7
Lockwood, Nixon	Wet	> = <	1 2 4	1 2 4	1 2 4	1 2 4
	Median	> = <	0 1 6	0 1 6	0 1 6	0 1 6
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7

**Table 3.95—Rafting –
Number of months various flows occur in 7-month recreation season**

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Truckee River: Lake Tahoe to Donner Creek	Wet	> = <	0 6 1	0 6 1	0 6 1	0 3 4
	Median	> = <	0 0 7	0 0 7	0 0 7	0 0 7
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7

**Table 3.95—Rafting –
Number of months various flows occur in 7-month recreation season – continued**

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Truckee River: Donner Creek to Little Truckee River	Wet	> = <	3 0 4	3 0 4	3 0 4	3 0 4
	Median	> = <	0 0 7	0 0 7	0 0 7	0 0 7
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Truckee River: Little Truckee River to State line	Wet	> = <	3 1 3	3 0 4	3 0 4	3 0 4
	Median	> = <	1 1 5	1 1 5	1 1 5	1 1 5
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Trophy	Wet	> = <	0 3 4	0 3 4	0 3 4	0 3 4
	Median	> = <	0 0 7	0 0 7	0 0 7	0 0 7
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Mayberry, Oxbow, Spice	Wet	> = <	0 2 5	0 2 5	0 2 5	0 3 4
	Median	> = <	0 0 7	0 0 7	0 0 7	0 0 7
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Lockwood, Nixon	Wet	> = <	1 2 4	1 2 4	1 2 4	1 2 4
	Median	> = <	0 0 7	0 0 7	0 0 7	0 0 7
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7

**Table 3.96—Kayaking –
Number of months various flows occur in 7-month recreation season**

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Truckee River: Truckee River: Lake Tahoe to Donner Creek	Wet	> = <	0 6 1	0 6 1	0 6 1	0 3 4
	Median	> = <	0 0 7	0 0 7	0 0 7	0 0 7
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Truckee River: Donner Creek to Little Truckee River	Wet	> = <	3 0 4	3 0 4	3 0 4	3 0 4
	Median	> = <	0 0 7	0 0 7	0 0 7	0 0 7
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Truckee River: Little Truckee River to State line	Wet	> = <	3 0 4	3 0 4	3 0 4	3 0 4
	Median	> = <	0 2 5	0 2 5	0 2 5	0 2 5
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Trophy	Wet	> = <	0 3 4	0 3 4	0 3 4	0 3 4
	Median	> = <	0 0 7	0 0 7	0 0 7	0 0 7
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7
Mayberry, Oxbow, Spice	Wet	> = <	0 2 5	0 2 5	0 2 5	0 3 4
	Median	> = <	0 0 7	0 0 7	0 0 7	0 0 7
	Dry	> = <	0 0 7	0 0 7	0 0 7	0 0 7

**Table 3.96—Kayaking –
Number of months various flows occur in 7-month recreation season – continued**

River/tributary reach	Hydrologic condition	Relation to desired flows	Current conditions	No Action	LWSA	TROA
Lockwood, Nixon	Wet	>	1	1	1	1
		=	2	2	2	2
		<	4	4	4	4
	Median	>	0	0	0	0
		=	1	1	1	1
		<	6	6	6	6
	Dry	>	0	0	0	0
		=	0	0	0	0
		<	7	7	7	7

Flows for spin/lure/bait fishing are the same in the median and dry hydrologic conditions under No Action and current conditions. In wet hydrologic conditions, desired flows do not occur under No Action, compared to one month under current conditions. Because the majority of anglers are generalists who are engaged by other aspects of the overall recreation experience and for whom angling may be secondary to camping, there would be no effect.

(2) Prosser Creek: Prosser Creek Reservoir to Truckee River

Operations model results show the same flows for fly fishing under No Action and current conditions in wet and dry hydrologic conditions. In median hydrologic conditions, one month of desired flows occurs under No Action compared to no months under current conditions. The effect on fly fishing would be insignificant.

The same number of months with desired flows for spin/lure/bait fishing occurs in wet hydrologic conditions under No Action and current conditions. In median and dry hydrologic conditions, one month with desired flows occurs under No Action compared to no months under current conditions. However, because of the relatively small numbers of fly anglers in this creek, the overall effect on spin/lure/bait fishing would be insignificant.

(3) Independence Creek: Independence Lake to Little Truckee River

No data are available to determine desired flows for fishing in this reach.

(4) Little Truckee River: Independence Creek to Stampede Reservoir

Operations model results show the same flows for flying fishing under No Action and current conditions. In both wet and median hydrologic conditions, desired flows occur 2 months; less-than-desired flows occur more frequently than greater-than-desired flows, which could displace fly anglers to other streams and creeks offering with more suitable flows. However, an insignificant number of anglers likely would be displaced, because

many would continue to pursue their sport during non-desired flows to enjoy other aspects of the experience, such as refining casting skills, enjoying solitude, and viewing scenic vistas.

Flows for spin/lure/bait fishing also are the same under current conditions and No Action: desired flows occur 2 months in wet hydrologic conditions, and 1 month in median hydrologic conditions. More spin/lure/bait anglers than fly anglers would be displaced by non-desired flows, which could result in crowding and increase use pressure on parking areas and sanitation facilities at locations with better fishing conditions.

(5) Little Truckee River: Stampede Reservoir to Boca Reservoir

Operations model results show 1 more month with desired flows for fly fishing under No Action (total of 2 months) than under current conditions in both wet and median hydrologic conditions, and no desired flows in dry hydrologic conditions under either No Action or current conditions. In all hydrologic conditions, when flows are less than or greater than desired, fly anglers could be displaced to other streams and creeks offering with suitable flows. However, as in the Little Truckee River from Independence Creek to Stampede Reservoir, an insignificant number of anglers likely would be displaced, because many would continue to pursue their sport during non-desired flows to enjoy other aspects of the experience, such as refining casting skills, enjoying solitude, and viewing scenic vistas, which would be especially true in light of the abundance of open meadows that offer excellent terrain for casting and enjoying scenic vistas.

Flows for spin/lure/bait fishing are the same under No Action and current conditions: desired flows occur in 2 months in wet hydrologic conditions and in 3 months in median hydrologic conditions. Desired flows do not occur in dry hydrologic conditions. Consequently, spin/lure/bait anglers could be displaced to other locations with more suitable flows, which could result in crowding and excessive pressure on those areas.

(6) Truckee River: Lake Tahoe to Donner Creek

Operations model results show the same flows for fly fishing under No Action and current conditions: 5 months with desired flows in wet hydrologic conditions and less-than-desired flows throughout the recreation season in median and dry hydrologic conditions. These less-than-desired flows could diminish the fly fishing experience. However, because of the multiple-use nature of this reach of river and the numbers of recreationists, fly anglers here are, for the most part, not the highly skilled and dedicated practitioners of the sport. Therefore, fewer fly anglers would likely be displaced than in other, less popular, reaches.

Flows are the same for spin/lure/bait fishing under No Action and current conditions: 6 months with desired flows in wet hydrologic conditions and less-than-desired flows throughout the recreation season in median and dry hydrologic conditions.

Flows for rafting and kayaking are similar to those for fly and spin/lure/bait fishing: 6 months with desired flows in wet hydrologic conditions and no months with desired flows in median and dry hydrologic conditions under both No Action and current conditions. In general, flows are less than preferred, which could adversely affect commercial guided rafting companies, prompting them to shift operations to other areas with better flows or cease operations. Unguided rafting would be expected to continue regardless of flows.

(7) Truckee River: Donner Creek to Little Truckee River Confluence

Operations model results show that flows for fly fishing are the same under No Action and current conditions. Conditions would be the best in wet hydrologic conditions, with 2 months of desired flows, compared to no months with desired flows in median and dry hydrologic conditions. Because of the many fish in the river, together with favorable terrain, open banks for casting, and nice scenery, few anglers would likely move because they would continue to enjoy other aspects of the experience in this reach.

Flows for spin/lure/bait fishing are the same under No Action and current conditions, including 3 months with desired flows in wet and median hydrologic conditions, or almost half of the recreation season. Thus, few anglers would likely be displaced to other areas.

No desired flows for rafting and kayaking occur under either No Action or current conditions in any hydrologic condition, although operations model results show 3 months with greater-than-desired flows in wet hydrologic conditions under both No Action and current conditions. As result, several of the rapids could become Class III whitewater, which could cause more accidents and dangerous conditions for less practiced boaters. In median and dry hydrologic conditions, flows are less than preferred, thus making the river easier for novice and intermediate rafters and kayakers. More advanced boaters could be displaced to other areas with higher flows; however, this displacement could be offset by lower flows that could attract more beginning and intermediate users.

(8) Truckee River: Little Truckee River to State Line

Operations model results show that flows are the same for fly fishing under No Action and current conditions. Flows are consistently greater-than-desired in wet hydrologic conditions. Flows are also greater than desired in median hydrologic conditions, except for 1 month with desired flows. In dry hydrologic conditions, under No Action, 1 month fewer with less-than-desired flows occurs than under current conditions. Fly anglers could remain or find other places to fish with more favorable flows. However, minimal displacement would occur because most anglers are likely seeking other recreational attributes that complement the fishing experience, such as scenic viewing, picnicking, or camping, that would not be affected by high flows.

Spin/lure/bait anglers would fare much better than fly anglers in this reach of river. Again, operation model results show the same flows under both No Action and current conditions: desired flows occur 3 months in wet hydrologic conditions; 4 months in

median hydrologic conditions, and 5 months in dry hydrologic conditions. Thus, overall, flows for spin/lure/bait anglers would be relatively favorable under either current conditions or No Action.

Flows for rafting differ between No Action and current conditions only in wet hydrologic conditions; under No Action 1 less month with desired flows occurs than under current conditions. In median and dry hydrologic conditions, flows are less than desired almost throughout the recreation season, which could adversely affect the recreation experience by lowering the skills required and making the experience more passive. Experienced rafters could look for more favorable flows elsewhere.

Flows for kayaking are the same under both No Action and current conditions. Flows in median hydrologic conditions are most favorable for kayaking, with 2 months with desired flows. Flows are either greater than desired or less than desired in wet hydrologic conditions and are consistently less than preferred in dry hydrologic conditions. The effect on kayaking would be the same as for rafting in this reach of river.

(9) Trophy

Operations model results show that in this reach, flows for fly fishing differ somewhat between No Action and current conditions: 1 less month with desired flows occurs under No Action than under current conditions in wet hydrologic conditions and 1 more month (total of 3 months) occurs in median hydrologic conditions. A total of 3 months with desired flows occur under both No Action and current conditions in dry hydrologic conditions. Less-than-desired river flows could displace a percentage of fly anglers.

For spin/lure/bait fishing, operations model results show the following: 1 more month with desired flows occurs under No Action than under current conditions in wet and median hydrologic conditions (total of 3 and 2 months, respectively) and 2 months with desired flows occur in dry hydrologic conditions under both No Action and current conditions. Less-than-desired flows would probably not displace as many spin/lure/bait anglers as fly anglers because of many deep pools that would retain sufficient water for spin/lure/bait angling despite less-than-desired flows.

Flows for both rafting and kayaking are the same under No Action and current conditions: 3 months with desired flows in wet hydrologic conditions and less-than-desired flows in median and dry hydrologic conditions. Less-than-desired flows could serve to displace commercial rafting/kayaking companies and advanced-to-expert enthusiasts who equate higher flows with the challenge and skill application essential to the quality of the experience.

(10) Mayberry, Oxbow, Spice

Operations model results show 1 month with desired flows for fly fishing in median hydrologic conditions under No Action compared to no desired flows under current

conditions and no desired flows under either No Action or current conditions in wet and dry hydrologic conditions. However, because of the relatively few fly anglers, these flows would have an insignificant effect on the sport.

Desired flows for spin/lure/bait fishing occur 2 months in wet hydrologic conditions under both current conditions and No Action; however, less-than-desired flows occur under No Action, while greater-than-desired flows occur throughout the remainder of the recreation season under current conditions. In median hydrologic conditions, flows are either greater than preferred or less than preferred under current conditions, compared to 1 month with desired flows under No Action. In dry hydrologic conditions, no months with desired flows occur under No Action, compared to 1 month under current conditions. However, because most of the fishing in this reach of river is supplemented by stocked fish, flow levels are less important because stocked fish are easier to catch than wild fish and will more readily strike lures or bait under differing conditions. Therefore, success rates for spin/lure/bait anglers should be higher, regardless of flows.

Flows for rafting and kayaking are the same under No Action and current conditions: desired flows only occur in wet hydrologic conditions (2 months); flows are less than preferred for the rest of the season. Less-than-desired flows also occur throughout the recreation season in median and dry hydrologic conditions, which could have the same effects as discussed under "Trophy."

(11) Lockwood, Nixon

Operations model results show that flows for fly fishing are the same under No Action and current conditions. Desired flows only occur in median hydrologic conditions and only in 1 month. Greater-than-desired flows only occur in wet hydrologic conditions, and less-than-desired flows occur the remainder of the time. These flows have minor significance, however, because of the relatively few fly anglers on this reach of river.

Likewise, flows for spin/lure/bait fishing are the same under No Action and current conditions. Desired flows only occur in wet (2 months) and median hydrologic conditions. Less-than-desired flow occur the remainder of the time. Again, these model results are of minor significance because of the relatively few spin/lure/bait anglers on this reach.

Flows for both rafting and kayaking are the same under No Action and current conditions.

b. LWSA

(1) Donner Creek: Donner Lake to Truckee River

Operations model results show that flows for fly fishing are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

In wet hydrologic conditions, no desired flows for spin/lure/bait fishing occur under LWSA (or No Action) compared to 1 month under current conditions. Flows are the same in median and dry hydrologic conditions under LWSA, No Action, and current conditions. Effects would be the same as under No Action.

(2) Prosser Creek: Prosser Creek Reservoir to Truckee River

Operations model results show that flows for fly fishing are the same under LWSA, No Action and current conditions, and effects would be the same as under No Action. Desired flows for spin/lure/bait fishing are the same in wet hydrologic conditions under LWSA, No Action, and current conditions. In median and dry hydrologic conditions, 1 month with desired flows occurs under LWSA and No Action compared to no desired flows under current conditions. However, because of the relatively few spin/lure/bait anglers, the effect would be insignificant.

(3) Independence Creek: Independence Lake to Little Truckee River

No data are available to determine desired flows for fishing in this reach.

(4) Little Truckee River: Independence Creek to Stampede Reservoir

Operations model results show that flows for fly fishing are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

Flows for spin/lure/bait fishing also are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

(5) Little Truckee River: Stampede Reservoir to Boca Reservoir

Operations model results show 1 more month with desired flows for fly fishing under LWSA and No Action than under current conditions in both wet and median hydrologic conditions and no desired flows in dry hydrologic conditions under LWSA, No Action, and current conditions. Effects would be the same as under No Action.

Flows for spin/lure/bait fishing are the same under LWSA, No Action and current conditions, and effects would be the same as under No Action.

(6) Truckee River: Lake Tahoe to Donner Creek

Operations model results show that flows for fly fishing are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

Flows for spin/lure/bait fishing also are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

Flows for rafting and kayaking also are the same under LWSA, No Action, and current conditions. Effects would be the same as under No Action.

(7) Truckee River: Donner Creek to Little Truckee River

Operations model results show that flows for fly fishing are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

Flows for spin/lure/bait fishing also are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action. Flows for kayaking and rafting also are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

(8) Truckee River: Little Truckee River to State Line

Operations model results shows that flows for fly fishing are the same under LWSA, No Action, and current conditions in wet and median hydrologic conditions. In dry hydrologic conditions, 4 months with greater-than-desired flows occur under LWSA and current conditions compared to 5 months under No Action.

Flows for spin/lure/bait fishing are the same under LWSA, No Action, and current conditions, and effects would be the same as under No Action.

Flows and the subsequent effects on rafting under LWSA are the same as under No Action. Flows for kayaking are the same as under No Action and current conditions, and effects would be the same as under No Action.

(9) Trophy

Operations model results show that flows for fly fishing, spin/lure/bait fishing, rafting, and kayaking under LWSA are the same as under No Action, and effects would be the same as under No Action.

(10) Mayberry, Oxbow, Spice

Flows for fly fishing, spin/lure/bait fishing, rafting, and kayaking under LWSA are the same as under No Action, and effects would be the same as under No Action.

(11) Lockwood, Nixon

Operations model results show that flows for fly fishing, spin/lure/bait fishing, rafting, and kayaking under LWSA are the same as under No Action and current conditions, and effects would be the same as under No Action.

c. TROA

(1) Donner Creek: Donner Lake to Truckee River

Operations model results show that flows for fly fishing are similar under TROA, No Action, and current conditions and effects would be the same as under No Action.

Flows for spin/lure/bait fishing under LWSA are the same as under No Action, and effects would be the same as under No Action.

(2) Prosser Creek: Prosser Creek Reservoir to Truckee River

Operations model results show 1 month with desired flows in wet hydrologic conditions under TROA compared to no desired flows under either No Action or current conditions, and 2 months with desired flows in median hydrologic conditions, compared to 1 month under No Action and no desired flows under current conditions. Flows in dry hydrologic conditions are the same under TROA, No Action, and current conditions. Overall, effects would be the same as under No Action.

One month with desired flows for spin/lure/bait fishing occurs in wet hydrologic conditions under TROA, compared to no desired flows under either No Action or current conditions. In median hydrologic conditions, 2 months with desired flows occur under TROA, compared to 1 month under No Action and no desired flows under current conditions. As a result, flows for spin/lure/bait fishing in this reach are best under TROA. However, because of the relatively few fly anglers, this difference between the alternatives and current conditions is relatively insignificant.

(3) Independence Creek: Independence Lake to Little Truckee River

No data are available to determine desired flows for fishing in this reach.

(4) Little Truckee River: Independence Creek to Stampede Reservoir

Operations model results show that flows for fly fishing and spin/lure/bait fishing also are the same under TROA as under No Action and current conditions, and effects would be the same as under No Action.

(5) Little Truckee River: Stampede Reservoir to Boca Reservoir

Operations model results show 2 more months with desired flows for fly fishing under TROA (total of 4 months) than under No Action and 3 more months than under current conditions in both wet and median hydrologic conditions. No desired flows occur in dry hydrologic conditions under TROA, No Action, or current conditions. In both wet and median hydrologic conditions, conditions under TROA would be more favorable for fly anglers.

One more month with desired flows for spin/lure/bait fishing occurs in wet hydrologic conditions under TROA (total of 3 months) than under No Action or current conditions. Flows in median and dry hydrologic conditions are the same under TROA as under No Action and current conditions. Overall, effects would be the same as under No Action.

(6) Truckee River: Lake Tahoe to Donner Creek

Operations model results show that flows for fly fishing are the same under TROA as under No Action and current conditions, and effects would be the same as under No Action. Flows for spin/lure/bait fishing vary only in wet hydrologic conditions under

TROA, No Action, or current conditions, when 4 fewer months of desired flows (total of 2 months) occur under TROA than under No Action or current conditions. Effects would be the same as under No Action.

Three fewer months with desired flows for rafting and kayaking occur under TROA than under No Action or current conditions (total of 6 months each). Desired flows are the same in both median and dry hydrologic conditions under TROA, No Action, and current conditions. Effects would be the same as under No Action.

(7) Truckee River: Donner Creek to Little Truckee River

Operations model results show several minor differences in flows for fly fishing under TROA, No Action, and current conditions in wet and median hydrologic conditions. In wet hydrologic conditions, no desired flows occur under TROA, compared to 2 months under both No Action and current conditions. Flows are consistently less than preferred under TROA. In median and dry hydrologic conditions, no desired flows occur under TROA, No Action, or current conditions. Overall, effects would be the same as under No Action.

For spin/lure/bait fishing, 3 fewer months with desired flows occur (total of 1 month) in wet hydrologic hydrologic conditions and 1 less month with desired flows (total of 2 months) occurs in median hydrologic conditions under TROA than either current conditions or No Action. Flows are less than preferred throughout the recreation season under TROA, No Action, and current conditions. Overall effects would be the same as under No Action.

Flows for rafting and kayaking are the same under TROA, No Action, and current conditions, and effects would be the same as under No Action.

(8) Truckee River: Little Truckee River to State Line

Operations model results show that flows for fly fishing differ under TROA, No Action, and current conditions. In wet and median hydrologic conditions, 1 month of desired flows occurs under TROA compared to no desired flows under either No Action or current conditions. In dry hydrologic conditions, 2 months with desired flows occurs under TROA compared to 1 month under No Action and current conditions. Flows that are not preferred range tend to be greater-than-desired flows. Effects would be the same as under No Action.

Flows for spin/lure/bait fishing also are the same under TROA as under No Action and current conditions, and effects would be the same as under No Action.

Flows for rafting vary under TROA, No Action, and current conditions in wet and median hydrologic conditions. In wet hydrologic conditions, no desired flow occurs under TROA and No Action compared to 1 month under current conditions. In median hydrologic conditions, 2 months with desired flows occur under TROA, compared to

1 month under both No Action and current conditions. Effects generally would be the same as under No Action, except that flows could be more favorable under TROA in median hydrologic conditions.

Flows for kayaking are the same under TROA, No Action, and current conditions, and effects would be the same as under No Action.

(9) Trophy

Operations model results show that flows for fly fishing vary somewhat under TROA, No Action, and current conditions. In wet hydrologic conditions, under TROA, 1 fewer month with desired flows occurs than under No Action and 2 fewer months occur than under current conditions. In median hydrologic conditions, 1 fewer month with desired flows occurs under TROA and current conditions (total of 3 months) than under No Action. Three months with desired flows occur in dry hydrologic conditions under TROA, No Action, and current conditions. Two more months with less-than-desired flows occur under TROA and current conditions than under No Action. Overall, flows would be less preferable fly anglers in this reach under TROA than under No Action and current conditions, which could serve to displace a percentage of fly anglers.

Flows for spin/lure/bait fishing also vary under TROA, No Action, and current conditions. In wet and median hydrologic conditions, 1 fewer month with desired flows occurs under TROA and current conditions than under No Action. In dry hydrologic conditions, 2 months with desired flows occur under TROA, No Action, and current conditions. When flows are less than preferable, spin/lure/bait anglers could voluntarily seek out other streams and reaches of the river with more favorable flows, acting to concentrate anglers in those locations. This concentration could result in overuse of parking areas, facilities, and access points. Less-than-desired flows probably would not displace as many spin/lure/bait anglers as fly anglers because of the presence of many deep pools that would retain sufficient water for spin/lure/bait angling despite less-than-desired flows.

Flows for rafting and kayaking are the same under TROA, No Action, and current conditions, and effects would be the same as under No Action.

(10) Mayberry, Oxbow, Spice

Operations model results show one more month with desired flows (total of 1 month) for fly fishing in median hydrologic conditions under both TROA and No Action. In wet and dry hydrologic conditions, no desired flows occur under TROA, No Action, or current conditions. However, because of the relatively few fly anglers, greater-than-desired flows (wet hydrologic conditions) and less-than-desired flows would have an insignificant affect.

Flows for spin/lure/bait fishing vary somewhat in wet hydrologic conditions, with 1 fewer month (total of 1 month) with desired flows under TROA than under No Action and current conditions. No desired flows occur in median hydrologic conditions, no

desired flows occur under TROA, No Action, or current conditions. In dry hydrologic conditions, no desired flows occur under current conditions compared to 1 month under current conditions. Effects would be the same as under No Action.

Flows for rafting and kayaking are the same under TROA, No Action, and current conditions, except that 3 months with desired flows occurs in wet hydrologic conditions under TROA compared to 2 months under No Action and current conditions. Effects would be the same as under No Action.

(11) Lockwood, Nixon

Operations model results show that flows for fly fishing, spin/lure/bait fishing, rafting, and kayaking are the same under TROA as under No Action and current conditions, and effects would be the same as under No Action.

5. Mitigation

No mitigation would be required because no significant adverse effects would occur under any of the alternatives. As river conditions change, though, some users would move to areas with more desirable flows for their activity; however, these users could be replaced by other users who may find the new flows more conducive for their type of recreation activity.

ECONOMIC ENVIRONMENT

I. Affected Environment

This section provides an overview of the current economic environment of the study area and a description of aspects of the regional economy that could be affected by modifying operations of Truckee River reservoirs and changing the allocation of water use.

A. Current Economic Environment

1. California

The California portion of the study area includes the eastern parts of El Dorado, Nevada, and Placer Counties and the southeastern part of Sierra County. Population centers include South Lake Tahoe (El Dorado), Truckee (Nevada), and Tahoe City (Placer). The economies of the western parts (outside the study area) and eastern parts (inside the study area) of these counties vary greatly. Most of the population (88 percent) resides and is employed in the western parts of the counties, primarily because of the influence of metropolitan Sacramento and the presence of large manufacturing, service, and agricultural sectors. The remaining 12 percent resides within the study area.

The Lake Tahoe tourist industry is an important contributor to the economy of eastern El Dorado and Placer Counties, which contain the western portion of the lake. Approximately 78 percent of the total employment in the California portion of the study area is located in the eastern side of these two counties. The industry includes lake-based recreation in the summer and skiing and snowmobiling in the winter, which generate employment and income in the retail trade and service sectors of the economy. Some residents of these counties are also employed by the hotel, gaming, and recreation industry on the Nevada side of South Lake Tahoe.

In Nevada County, tourism, skiing, and recreation on Donner Lake and Prosser Creek, Stampede, and Boca Reservoirs and along the Truckee River generate income and employment in the retail trade and service sectors. In the Truckee-Donner area, important economic sectors are retail trade, services, real estate, and construction.

Most of Sierra County is rural and contains Tahoe and Toiyabe National Forests. The government sector employs about 40 percent of workers in the entire county, mostly in State and local government. Logging and sawmill operations and recreational activities also generate some employment and income.

2. Nevada

The Nevada portion of the study area includes parts of Douglas, Lyon, Washoe and Churchill Counties. Population centers include Fernley (Lyon) and Reno-Sparks, Wadsworth, Nixon, and Sutcliffe (Washoe). Fallon is located in Churchill County in the lower Carson River basin.

The hotel, gaming, and recreation industry is also important to the economies of the Nevada counties within the study area. Agriculture, government, and construction and mining also contribute to the economy.

In Douglas County, which contains the southeast portion of Lake Tahoe, approximately 50 percent of employment and earnings are derived from the service sector. Within the service sector, more than 50 percent of the employment is in the hotel, gaming, and recreation industry.

The economy of Lyon County is based mostly on manufacturing, services, and agriculture. The county is noted for its alfalfa and beef cattle production. The northwestern part of the county, Fernley, and a portion of the Truckee Division of the Newlands Project is in the study area. Fernley has been growing in the past decade due to its proximity to Truckee Meadows.

Washoe County, which contains the northeast portion of Lake Tahoe, Pyramid Lake, and the rapidly growing Truckee Meadows, is the most populous and economically diverse county in the study area. This county's economy has expanded over the past 20 years, because of growth in the hotel and casino industry, warehousing, and manufacturing. A majority of the study area's employment (84 percent) occurs in Truckee Meadows. Important economic sectors are service, manufacturing, retail trade, and government. Expenditures related to the recreational activities at Pyramid Lake also contribute to local economy. There are irrigated lands within Truckee Meadows.

Churchill County is located east of Storey and Lyon Counties. In the past, agriculture and mining were the dominant economic sectors in the county (MacDiarmid, et. al, 1994). In the past decade, however, the county's economic structure has become more diversified and is now mostly based on services, government, trade, manufacturing, and agriculture (Darden, et. al, 2003). NASF is a major source of employment and income. An estimated 2,900 county residents are employed directly or indirectly by service sector employment attributed to the presence of NASF (Churchill County Economic Development Authority, 2003). In the Fallon area, there are plans for development of industrial/business park to accommodate new businesses locating in the area. The area is also attracting retirees.

Churchill County includes most of the Newlands Project's Truckee Division and all of the Carson Division. The project generates most of the agricultural production in

Churchill County. The Truckee River provides a portion of the project's irrigated water supply via the Truckee Canal. Alfalfa and livestock are primary agricultural commodities produced in the area.

From 1987 to 1997, irrigated acreage in Churchill County declined by approximately 24 percent. During the drought years from 1990 to 1994, alfalfa hay acreage did not significantly change but crop yield did decline by about 25 percent in 1992. From 1997 to 2002, irrigated acreage increased slightly (about 4 percent). Thus, overall, from 1987 to 2002, irrigated acreage declined by 20 percent (1997 and 2002 Census of Agriculture, Nevada). The decline is most probably due to changing agricultural markets and the increasing demand for non-agricultural water in the area. In the future, water right purchases under the Truckee River Water Quality Settlement Agreement, Nevada State AB 380 program, Water Rights Acquisition Program for Lahontan Valley wetlands, and by private developers will continue the trend of declining agricultural water rights and irrigated agriculture in Churchill County.

B. Employment and Total Income

Table 3.97 presents employment and total income for those parts of the counties within the study area. Data were derived from baseline data collected for the regional economic model. Employment and income associated with recreation expenditures under current conditions, No Action, LWSA, and TROA are discussed under "Recreation Expenditures."

Employment is based on the number of full- and part-time jobs within the study area. Total income is defined as personal income, which is based on wages, salaries, other income, dividends, interest, rent, and government transfer payments.

1. California

Major employment sectors (more than 10 percent of total employment) in the California portion of the study area are construction (13 percent); wholesale and retail trade (19 percent); finance, insurance, and real estate (10 percent); and services (20 percent). El Dorado County reported the most full- and part-time nonagricultural jobs (12,097), followed by Placer County (6,792), Nevada County (4,775), and Sierra County (150). The estimated total income in 2002 for those portions of the California counties within the study area was approximately $576 million.

2. Nevada

Major employment sectors in the Nevada portion of the study area are hotels, gaming, and recreation (14 percent); services (21 percent); wholesale and retail trade (16 percent); and State and local government (10 percent). Agriculture, construction, manufacturing, and mining also contribute to the economy. Washoe County reported the most full- and part-time nonagricultural jobs (238,577), followed by Churchill County (11,533), and

Table 3.97—Employment and income in the study area, 2002

	Total income (million $)	Total employment (full- and part-time jobs)
Portions of California counties		
El Dorado	272.3	12,097
Nevada	117.0	4,775
Placer	183.0	6,792
Sierra	3.9	150
California total	$ 576.2	23,814
Nevada counties		
Douglas	$221.5	3,754
Churchill	$662.0	11,533
Lyon	$870.3	13,825
Washoe	$13,420.2	238,577
Nevada total	$15,174.	267,689
Total	$15,750.2	291,503

[1] Only those portions of the California counties and Douglas County, Nevada, within the study area are included in this analysis.
Sources: University of Nevada, Reno, Technical Reports UCED2005/06-07 and 98/99-04; U.S. Department of Commerce, "Regional Economic Information System," Washington D.C., 2002.

Lyon County (13,825) of which Fernley's employment is approximately 3,200 jobs and Douglas County (3,754). In 2002, estimated total income for those portions of the Nevada counties within the study area was $15,174 million.

C. Agricultural and M&I Water Use

Current agricultural and M&I water use in the study area are discussed in "Water Resources." In the future, TMWA is expected to continue to acquire agricultural water rights in Truckee Meadows to meet increased M&I demands.

Most agricultural production within the study area occurs in Churchill County, followed by Washoe County and the small portion in Lyon County. The Newlands Project is located in Churchill County; it primarily produces alfalfa, other hay, irrigated pasture, cereal/grains, livestock, and dairy products.

Current agricultural water rights are about 28,283 acre-feet per year in Truckee Meadows and about 13,885 acre feet per year in the Truckee Division. For Truckee Meadows, most of these rights are in small acreage and, if the water is used, it is mostly for pasture

in livestock production. The primary crops grown in the study area are alfalfa hay, other hay and pasture. Livestock and dairy production also occur in the area. Total gross agricultural output is approximately $133 million. Total employment and personal income, based on 2002 data for the agricultural sector, are approximately 1,109 jobs and $16 million, respectively. As of 2002, TMWA had dedicated 57,170 acre-feet of agricultural water rights for future M&I use. M&I demand in Truckee Meadows is 83,140 acre-feet per year.

II. Environmental Consequences

A. Introduction

Modifying operations of Truckee River reservoirs could affect the study area economy by: (1) changing lake and reservoir storage, (2) changing the quality, quantity, timing, and duration of flows (3) reducing hydroelectric power generation along the Truckee River and (4) affecting groundwater usage in the Truckee Meadows area.

Changes in reservoir storage could affect recreation visitation and, thus, affect recreation expenditures. The change in recreation expenditures could "ripple through" the economy, resulting in changes to recreation-related employment and income. Reducing hydroelectric power generation from plants along the river could affect associated revenues. The hydroelectric power generation along the river is classified as "nonfirm baseload power," which is low cost to produce but is not a reliable source because of the variability of Truckee River flows.

Allowing for different storage amounts of M&I and agricultural water in the Truckee River basin could also affect the study area economy. Future water demand in urban areas will require the purchase of agricultural water rights and storage to be used for M&I purposes. TROA would provide the flexibility to store and release water for these two uses in the upper basin reservoirs. This flexibility in storage would allow for reallocation of water from agriculture to M&I water use. The trend of declining agricultural water use to greater M&I water use in the study area should result in further changes in the agriculture economic sector, as well as those economic sectors that are supported by M&I water.

This analysis evaluated the effects of changes in lake and reservoir storage, changes in flows, changes in hydroelectric power revenue, and changes in water use on the study area economy using the following indicators:

- Employment and income affected by recreation visitation
- Employment and income affected by changes in water use
- Hydroelectric power generation and revenues
- Groundwater pumping costs

B. Summary of Effects

Table 3.98 summarizes current conditions and the effects of the alternatives on the study area economy. While the population in Truckee Meadows will most probably grow, as will the recreation demand within the study area, that growth and associated recreation demand would be the same under all alternatives. For the purposes of the EIS/EIR, it is important to estimate only that recreation visitation that would be linked to modifying operations of the reservoirs and streamflows and the associated expenditures.

1. Recreation-Related Employment and Income

Economic model results show that recreation-based employment and income are about the same under the alternatives as under current conditions (differences of less than 1 percent). Such small differences would not significantly affect the regional economy.

2. Employment and Income Affected by Changes in Water Use

Two analyses were conducted to show the effects of (1) meeting the M&I water demand in Truckee Meadows in 2033 and (2) transferring agricultural water rights in Truckee Meadows and the Truckee Division of the Newlands Project to M&I use.

For the first analysis, the economic model calculated the amount of employment and income that could be supported by the increase (approximately 36,000 acre-feet) in M&I water supplies from current conditions to meet the future M&I demand of 119,000 acre-feet in Truckee Meadows under No Action, LWSA, and TROA. Model results show the same amount of employment and income would be associated with that future demand under the alternatives.

For the second analysis, the economic model calculated the effects of transferring agricultural water rights on employment and income. Economic model results show slightly (less than 1 percent) less employment and income in the study area under No Action, LWSA, and TROA than under current conditions. The economic model also shows slightly less employment and income under TROA than under No Action; the overall effect on the regional economy would be less than 1 percent.

3. Hydroelectric Power Generation and Revenues

Analysis of operations model results shows that, under TROA, both hydroelectric power generation and gross revenues for Truckee River run-of-the-river hydroelectric powerplants are about .4 percent less than under No Action and .5 percent less than under current conditions in wet hydrologic conditions; about 3 percent less than under No Action and current conditions in median hydrologic conditions; and about 3 percent greater than under No Action and 4.6 percent greater under current conditions in dry hydrologic conditions. Any reduction in gross revenue would require compensation, as provided in section 7.A.6 of the Negotiated Agreement.

Table 3.98—Summary of effects on economic environment

Indicator	Current conditions	No Action	LWSA	TROA
Recreation-based employment and income	Baseline (California) Employment: 23,814 jobs Income: $576 million	About the same employment and income as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)
Employment and income affected by changes in water supply	Baseline (Nevada) Employment: 267,689 jobs Income: $15.2 billion	About the same employment and income as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)	Same as under No Action and about the same as under current conditions (differences of less than 1 percent)
Hydroelectric power generation and revenues: run-of-the-river	Wet hydrologic conditions: 67,829 MWh; $3.20 million	Wet hydrologic conditions: same as under current conditions	Wet hydrologic conditions: same as under No Action and current conditions	Wet hydrologic conditions: .4 percent less than under No Action; .5 percent less than under current conditions
	Median hydrologic conditions: 65,910 MWh; $3.11 million	Median hydrologic conditions: same as under current conditions	Median hydrologic conditions: approximately the same as under No Action and current conditions	Median hydrologic conditions: 3.1 percent less than under No Action; 3.1 percent less than under current conditions
	Dry hydrologic conditions: 45,985 MWh; $2.17 million	Dry hydrologic conditions: 1.8 percent greater than under current conditions	Dry hydrologic conditions: about the same as under No Action; 1.5 percent greater than under current conditions	Dry hydrologic conditions: 2.8 percent greater than under No Action; 4.6 percent greater than under current conditions
Hydroelectric power generation and revenues: Lahontan Dam	Wet hydrologic conditions: 26,837 MWh; $1.27 million	Wet hydrologic conditions: about 3 percent less than under current conditions	Wet hydrologic conditions: about the same as under No Action; about 3 percent less than under current conditions	Wet hydrologic conditions: same as under No Action; about 3 percent less than under current conditions
	Median hydrologic conditions: 22,866 MWh; $1.08 million	Median hydrologic conditions: about 3 percent less than under current conditions	Median hydrologic conditions: same as under No Action; about 3 percent less than under current conditions	Median hydrologic conditions: same as under No Action; about 3 percent less than under current conditions
	Dry hydrologic conditions: 21,520 MWh $1.02 million	Dry hydrologic conditions: about 3 percent less than under current conditions	Dry hydrologic conditions: same as under No Action; about 3 percent less under current conditions	Dry hydrologic conditions: same as under No Action; about 3 percent less than under current conditions
Total annual groundwater development costs	$1,520,395	$3,348,102 or 120 percent greater than under current conditions	40 percent greater than under No Action; $4,696,483 or 200 percent greater than under current conditions	36 percent less than under No Action; $2,151,982 or 42 percent greater than under current conditions

For Lahontan Dam hydroelectric powerplants, both generation and gross revenues under TROA are about the same as under No Action in all hydrologic conditions and about 3 percent less than under current conditions in all hydrologic conditions.

4. Groundwater Pumping Costs

On the basis of information provided by TMWA, groundwater usage to meet future M&I water demand would vary under current conditions, No Action, LWSA, and TROA. Groundwater production and recharge has associated capital, operation, and maintenance costs. Based on a comparison of the annual groundwater costs for each of the alternatives, the least cost alternative is TROA ($2.15 million), followed by No Action ($3.48 million), and LWSA ($4.70 million); all are more costly than current conditions ($1.52 million). Under No Action and LWSA, the higher annual costs are due to greater groundwater pumping. Groundwater pumping not only would be greater under LWSA than under current conditions and TROA, but because of groundwater recharge provisions for this alternative, it has greater future capital investments.

C. Recreation-Related Employment and Income

1. Method of Analysis

To analyze the effects on employment and income associated with recreation visitation, this analysis used two models: the recreation model and the regional (multi-county) input-output (I-O) model (economic model).

The recreation model first calculated recreation visitation associated with Truckee River flows and reservoir storage at Donner Lake and Prosser Creek, Stampede, and Boca Reservoirs in wet, median, and dry hydrologic conditions (10-, 50-, and 90-percent exceedences). River flows and storage were generated from the operations model. Next, the recreation model calculated recreation expenditures in the study area associated with recreation visitation. Then, the economic model estimated the employment associated with the recreation expenditures. Once total employment associated with recreation expenditures was estimated, the economic model calculated the income generated by the estimated employment.

The analysis considered the effects on those portions of El Dorado, Nevada, Placer, and Sierra Counties in California and those portions of Churchill, Lyon, and Washoe Counties in Nevada within the study area.

For Lahontan Reservoir, a separate economic analysis was conducted based on the recreation analysis. (See “Recreation.”) No significant regional economic impacts were identified by the recreation analysis.

a. Economic Model

Reclamation and the Center for Economic Development at University of Nevada, Reno developed the regional I-O model.

I-O models are used to estimate changes in employment and income brought on by changes in “outputs” or final demand. I-O analysis is based on the interdependence of

production and consumption sectors in a regional area. Industries must purchase “inputs” from other industries, as well as primary inputs (e.g., water) to produce outputs that are sold either to other industries or to final consumers. Thus, a set of I-O accounts can be thought of as a "picture" of a study area’s economic structure. Flows of industrial inputs can be traced via the I-O accounts to show linkages between the industries composing the regional economy. The accounts are also transformed into a set of simultaneous equations that permit the estimation of economic effects (e.g., changes in employment and income) resulting from changes in resources (e.g., water) and management activities.

For this study, the economic model was used to estimate the economic effects resulting from changes in the resource of water, i.e., Truckee River flows and storage in Donner Lake and Prosser Creek, Stampede, and Boca Reservoirs.

Using data collected from a 1999 recreation survey (see “Recreation Model”) the recreation model established a relationship between river flows and lake and reservoir storage (generated from the operations model) and recreation visitation. Changes in storage and river flows resulted in changes in recreation visitation. Changes in recreation visitation resulted in changes in recreation expenditures, which trickled through the regional economy, affecting intermediate industry purchases and final demand. The economic model then calculated the resulting changes in recreation-based employment and income in the study area.

Economic impact analysis is not an exact science. I-O methodology, as well as other methods, serves more as a broad indicator of changes to a regional economy due to changes in output and activities. For this study, the economic model was used as a tool to help identify the differences between the alternatives and current conditions and between the action alternatives and No Action.

b. Recreation Model

A recreation model was developed to provide input to the economic model and to calculate recreation visitation associated with Truckee River flows and Donner Lake and Prosser Creek, Boca, and Stampede Reservoir storage.

To develop recreation visitation data, more than 500 visitors along the Truckee River and at these reservoirs were surveyed during the 1999 recreation season. Day use visitors and campers were asked when they visited and how many visits they would make at different flow and storage levels. Visitors also were asked about their expenditures in the study area. (Recreation preferences concerning Lake Tahoe elevations were not collected because operations under the proposed action would not result in a measurable change in surface acreage. The Lake Tahoe economy [retail trade, eating and drinking, lodging, services, etc.] is accounted for in the economic impact function of the economic model.)

Using the survey data, the recreation model developed a mathematical relationship between river flows (generated from the operations model) and river-related recreation.

The survey also collected recreation visitor expenditure data at Donner Lake and Prosser Creek, Stampede, and Boca Reservoirs. Expenditures related to second homeowners from later research were also included in the data. These recreation expenditures, which are made in the regional economy, include such items as licenses, camping fees, hotels or motels, restaurants, groceries, equipment and supplies, rental charges, and fuel. Expenditure data were used to develop expenditure equations for camping and day use visitation. The expenditure equations were applied to the monthly camping and day use visitation estimates to calculate the monthly expenditure estimates based on lake and reservoir storage. These monthly expenditures were summed to a total annual recreation expenditure, which is defined as a direct impact on the regional economy.

To estimate the indirect and induced economic impacts, the direct impact (total annual recreation expenditure) calculated from the recreation model was linked to the economic model by allocating this annual expenditure into economic sectors, such as wholesale and retail trade, eating, drinking, and lodging. The direct impacts "flow though" these economic sectors, resulting in associated purchases of goods and services, which are defined as indirect impacts. The associated purchases of goods and services in the regional area, in turn, cause additional purchases of goods and services brought on by salaries and profits, which are defined as induced impacts. The total impact is the summation of the direct, indirect, and induced impacts brought on by recreation visitation at the lake and reservoirs included in this analysis.

For more information on the economic and recreation models, see the Economics and Recreation Appendix.

2. Threshold of Significance

Establishing a threshold of significance when conducting a regional economic impact analysis is difficult because effects depend on the size and types of employment and income from which effects can be measured (i.e., baseline). For recreation-related regional impact analysis, the baseline employment and income is the California portion the study area which is 23,800 jobs baseline and $576 million. It is reasonable to assume that a difference of 1 percent or less from the baseline employment and income under the alternatives is not significant. Thus, a difference of more than 1 percent from the baseline was considered significant.

3. Model Results

Table 3.99 presents annual recreation visitation and associated annual recreation expenditures at Donner Lake and Prosser Creek, Stampede, Boca Reservoirs, and along the river under current conditions and No Action, LWSA, and TROA in wet, median, and dry hydrologic conditions. These visitation and expenditure estimates are based on results from the operations and recreation models. Annual recreation visitation at the reservoirs and along the river covers the recreation activity during all 12 months of the year. Therefore, recreation visitation shown in this section is greater than that shown for the 7 prime recreation months in the "Recreation" section. The annual recreation

Table 3.99—Recreation visitation and expenditures

Location	Current conditions			No Action			LWSA			TROA		
	Wet	Median	Dry	Wet	Median	Dry	Wet	Median	Dry	Wet	Median	Dry
Annual recreation visitation												
Donner Lake	134,151	130,046	104,888	134,168	123,194	104,893	134,168	124,684	104,893	134,089	124,684	104,664
Prosser Creek Reservoir	21,531	19,435	9,220	21,574	19,840	11,233	21,574	20,592	11,327	21,487	20,592	15,321
Stampede Reservoir	73,779	71,335	16,156	73,795	71,015	16,373	73,795	73,504	16,358	73,810	73,256	40,997
Boca Reservoir	31,383	25,769	9,303	31,383	25,608	9,166	31,383	25,766	9,150	31,346	27,097	11,482
River recreation	77,571	114,940	123,123	78,775	126,333	123,265	78,781	126,310	123,184	89,984	127,630	117,989
Total annual visitation	338,415	361,525	262,690	339,695	365,990	264,930	339,701	370,856	264,912	350,716	373,259	290,453
Recreation expenditures ($)												
Donner Lake	8,040,428	7,794,388	6,286,543	8,041,462	7,383,714	6,286,851	8,041,462	7,473,036	6,286,851	8,036,756	7,473,036	6,273,111
Prosser Creek Reservoir	860,938	777,126	368,675	862,649	793,345	449,163	862,666	837,801	452,922	859,193	837,810	612,630
Stampede Reservoir	4,018,096	3,884,979	879,884	4,018,919	3,867,550	891,677	4,018,920	4,003,097	890,876	4,019,772	4,004,284	2,232,719
Boca Reservoir	1,132,770	930,140	335,675	1,132,770	924,336	330,837	1,132,770	930,030	330,286	1,131,446	978,071	414,442
River recreation	2,450,936	3,593,242	3,728,186	2,482,302	3,978,383	3,747,153	2,482,441	3,978,347	3,744,323	2,886,708	4,046,068	3,589,899
Total annual expenditures	16,503,168	16,979,875	11,598,963	16,538,102	16,947,328	11,705,681	16,538,259	17,222,311	11,705,258	16,933,875	17,339,269	13,122,801
Regional economic impacts												
Employment: Jobs	194	204	158	195	204	159	195	206	159	200	208	168
Income (millions $)	2.84	2.97	2.24	2.84	2.96	2.26	2.85	3.00	2.26	2.92	3.03	2.41
Compared to current conditions												
Difference: Jobs				+1	0	+1	+1	+2	+1	+6	+4	+10
Difference: Income (million $)				>+.01	-$.01	+$0.02	+$.01	+$.03	+$.02	+$.08	+$.06	+$.17
Compared to No Action												
Difference: Jobs							0	+2	0	+5	+4	+9
Difference: Income (million $)							+$.01	+$.04	0	+$.08	+$.07	+$.15

expenditures presented in table 3.99 were used to calculate recreation-related employment and income in the study area under current conditions and the alternative.

As shown in the "Recreation" section, changes in recreation visitation at Lahontan Reservoir would not be significant; therefore regional economic impacts also would not be significant.

Most of the direct recreation expenditures and, thus, most of the economic effects would occur in the Truckee River basin in California. Based on the total employment (23,800 jobs) for the California portion of the basin (table 3.99), the recreation-related economic impacts for all of the alternatives on employment are about 1 percent of the total employment in the upper basin of the study area. The income impacts are less than 1 percent of the total income for that portion of the study area.

4. Evaluation of Effects

a. No Action

Recreation model results show that annual recreation visitation and recreation expenditures are nearly the same under No Action and current conditions in wet, median, and dry hydrologic conditions.

At Donner Lake, estimated recreation visitation and expenditures are about the same in wet and dry hydrologic conditions. Visitation and expenditures are about 5 percent less in median conditions than under current conditions, which is made up by greater visitation and expenditures at other reservoirs and along the river corridor.

Under No Action, reservoir storage and streamflows at most sites (Water Resources Appendix) are slightly less than under current conditions during the summer recreation season. However, these differences are so slight that, under No Action, associated recreation visitation and recreation expenditures and, hence, associated employment and income, are essentially the same as under current conditions. The economic effects on regional employment and income are 1 percent or less and, therefore, not considered significant.

b. LWSA

Recreation visitation and expenditures under LWSA are about the same as under No Action in wet and dry hydrologic conditions and slightly (1.4 percent) greater in median hydrologic conditions. Overall, they are slightly (0.30-2.7 percent) greater in all three hydrologic conditions than under current conditions.

At Donner Lake, visitation and expenditures under LWSA are about same in wet and dry hydrologic conditions as under No Action or current conditions. In median hydrologic conditions, visitation and expenditure under LWSA are somewhat greater (1.2 percent) than under No Action and about 4 percent less than under current conditions. The effects of less visitation would be the same as under No Action.

Economic impact model results shows that, under LWSA, the slightly greater visitation and expenditures at most sites results in only slightly greater (less than 1 percent) or no change in employment and income compared to No Action or current conditions in wet, median, and dry hydrologic conditions.

c. TROA

Visitation and expenditures in wet and median hydrologic conditions under TROA are slightly greater (2-3.6 percent) than under No Action or current conditions. In dry hydrologic conditions, visitation and expenditures are 6 to 10 percent greater than under No Action or current conditions.

At Donner Lake, visitation and expenditures under TROA are slightly less (less than 1 percent) in wet and dry hydrologic conditions than under No Action or current conditions; they are slightly better (1.2 percent) in median hydrologic conditions than under No Action and about 4 percent less than under current conditions. Again, the slightly less recreation visitation and expenditures in median hydrologic conditions is made up by increases in other reservoirs and along the river corridor.

Under TROA, economic model results show 2-3 percent more recreation-related employment and income in wet and median hydrologic conditions than under current conditions or No Action. In dry hydrologic conditions, results show that employment and income under TROA are about 6 percent greater than under No Action or current conditions, equating to about 9 more jobs and $0.16 million in income. The effect would still not be significant when compared to the baseline regional employment and income or to the California portion of the regional baseline.

5. Mitigation

No mitigation would be required under NEPA because no significant adverse effects would occur under any of the alternatives. CEQA does not require mitigation for economic impacts.

D. Employment and Income Affected by Changes in Water Use

1. Method of Analysis

Two analyses were conducted to show the effects of (1) meeting the M&I water demand in Truckee Meadows in 2033 and (2) acquiring agricultural water rights in Truckee Meadows and the Truckee Division of the Newlands Project and transferring these rights to M&I use. (A negligible amount of water rights would be transferred in the Carson Division.) An underlying assumption was that TROA would provide greater flexibility to meet future water demand in Truckee Meadows by allowing more M&I water to be stored in the upper basin reservoirs.

For the first analysis, the economic model calculated the amount of employment and income that could be supported by the increase (approximately 36,000 acre feet) in M&I water supplies from current conditions to meet the M&I demand of 119,000 acre-feet in Truckee Meadows under No Action, LWSA, and TROA (i.e., in 2033).

To meet the future 119,000 acre-foot annual water demand, TMWA will need to augment its M&I water supplies. The M&I water supply will consist of numerous water sources, including purchased agricultural water rights. The market price for water rights is expected to increase in the future because of demand for a finite resource, i.e., surface water rights in the Truckee Meadows area, with diminishing availability. The increase in price or costs to obtain these water rights is not included in this analysis because of the difficulty of predicting these future costs. It is recognized that the future increase in the price for water rights is a cost which the water right purchaser and, ultimately, the final water user will incur. It is difficult to predict how these future costs could affect the regional economy at this time. The potential effect on the regional economy will depend on the amount of the cost increases and how these increases will be distributed in the regional economy.

The impact area for this analysis encompassed the Truckee River basin, but effects would be concentrated in Truckee Meadows and Fernley.

2. Threshold of Significance

As for the indicator of recreation-related employment and income, it is reasonable to assume that a difference of 1 percent or less from the baseline regional employment of 267,689 and baseline regional income of $15,174 million under the alternatives is not significant. Thus, a difference of more than 1 percent from the baseline indicators was considered significant.

3. Model Results

Table 3.100 presents the changes in water use under current conditions and the alternatives and the effects on employment and personal income. Results are derived from the operations and economic models.

4. Evaluation of Effects

a. No Action

(1) M&I Water Supplies

To meet the projected annual M&I demand of 119,000 acre-feet in Truckee Meadows, TMWA plans to continue to exercise its existing water rights and expand its conservation and water acquisition programs.

M&I water supplies in Truckee Meadows are expected to increase in the future, from approximately 83,140 acre-feet under current conditions to 119,000 acre-feet under

Table 3.100—Employment and income affected by changes in water use

M&I water supply				
	Current conditions	**No Action**	**LWSA**	**TROA**
M&I water supply (Truckee Meadows) (acre-feet)	83,140	119,000	119,000	119,000
Change in M&I water supply compared to current conditions (acre-feet)		+35,860	+35,860	+35,860
Economic indicators supported by change in M&I water supply (compared to current conditions)[1]				
Employment (jobs)		74,400	74,400	74,400
Personal income (millions $)		$2,566	$2,566	$2,566
Agricultural water rights (acre-feet)				
Truckee Meadows	28,283	14,915	14,915	2,916
Truckee Division (Fernley M&I water)	13,885	0	0	0
Total agricultural water rights	42,168	14,915	14,915	2,916
Economic indicators affected by transfer of agricultural water rights[2]				
Employment	267,689 (baseline)	267,558	267,558	[3]264,475
Personal income (millions $)	$15,174 (baseline)	15,171	15,171	[3]15,170

[1] The employment and income estimates are based on that portion of the regional economy that could be supported by the M&I water supply changes.
[2] Employment and income baseline estimates are shown for the Nevada counties in the study area.
[3] The benefits resulting from the transfer of agricultural water rights to meet future demands for M&I, water quality, recreation, and fish and wildlife habitat should be greater than the projected reduction in employment and income associated with the reduction of water rights for agricultural production in Truckee Meadows and the Truckee Division of the Newlands Project.

No Action (an increase of approximately 36,000 acre-feet). Economic model results show that this increase in M&I water supplies supports approximately 74,400 full- and part-time jobs and an associated $2.6 billion in personal income.

(2) Agricultural Water Rights

Irrigation water supplies are expected decline in the future because of the purchase of agricultural water rights in Truckee Meadows and Truckee Division of the Newlands Project for M&I water use. TMWA anticipates that developers in Truckee Meadows would continue under No Action the current practice of dedicating water rights for new service commitments. As stated previously, as of 2002, TMWA had dedicated 57,170 acre-feet of former agricultural water rights for future M&I use.

The operations model assumes that, under No Action, agricultural water demand will be reduced by 13,368 acre-feet through additional purchases of agricultural water rights in the Truckee Meadows area and reduced by 13,885 acre-feet in the Truckee Division through the purchases of agricultural water rights for Fernley and for Truckee River water quality under WQSA. Thus, under No Action, total agricultural water rights would be 27,253 acre-feet less than under current conditions, resulting in about 131 fewer full- and part-time jobs and $2.4 million less in income, or less than a 1 percent difference from baseline employment (267,689 jobs) and income ($15.2 billion) for the Nevada portion of the study area. It is not possible to identify precisely where in the study area employment and income loss will occur, but most of the direct impacts would occur in Truckee Meadows and the Fernley area.

b. LWSA

(1) M&I Water Supplies

M&I water supplies in Truckee Meadows under LWSA would be the same as under No Action, and the effects would be the same as under No Action.

(2) Agricultural Water Rights

Purchase and transfer of agricultural water rights in Truckee Meadows and the Truckee Division under LWSA would be the same as under No Action, and the effects would be the same as under No Action.

c. TROA

(1) M&I Water Supplies

Under TROA, M&I water supplies in Truckee Meadows would be the same as under No Action, and the effects would be the same as under No Action.

(2) Agricultural Water Rights

In Truckee Meadows, 25,367 acre-feet of agricultural water rights would be purchased and transferred under TROA. In the Truckee Division, 13,885 acre-feet of water rights also would be purchased and transferred (the same as under either No Action or LWSA). Thus, under TROA, a total of 39,252 acre-feet of agricultural water rights would be purchased and transferred, or about 12,000 acre-feet more than under No Action or LWSA. As a result, the economic model estimates 214 fewer jobs and $3.8 million less in personal income under TROA than under current conditions, and 83 fewer jobs and $1.42 million less in personal income than under No Action, or less than a 1 percent difference from baseline employment (267,689 jobs) and income ($15.2 billion) for the Nevada portion of the study area.

The benefits resulting from the transfer of agricultural water rights to meet future demands for M&I, water quality, recreation, and fish and wildlife habitat should be

greater than the projected reduction in associated employment and income that is related to the reduction of water rights for agricultural production in Truckee Meadows and the Truckee Division of the Newlands Project.

5. Mitigation

No mitigation would be required under NEPA because no significant adverse effects would occur under any of the alternatives. CEQA does not require mitigation for economic impacts.

E. Hydroelectric Power Generation and Revenues

The four Truckee River hydroelectric powerplants have a maximum capacity of about 10 megawatts. These plants provide non-firm base load power to the regional power system. In 1991, these plants provided less than 1 percent of the total electrical power generated from all of Sierra Pacific's plants. Low Truckee River flows could potentially affect power generation, but greater usage of combustion-generated power could replace any loss of the small amount of power generated by the hydroelectric powerplants resulting from low flows.

A separate analysis using the same methodology to estimate gross hydroelectric power generation and revenues was conducted for TCID's hydroelectric powerplants at Lahontan Dam.

1. Method of Analysis

For this study, gross hydroelectric power revenues were calculated based on the annual power generated by these hydroelectric powerplants in wet, median, and dry hydrologic conditions. Annual hydroelectric power generation was generated from the operations model. An annual energy value was calculated using the California-Oregon Border (COB) Electricity Price Index (2004 data).[7] A weighted annual average value based on firm daily peak and off peak power demand was estimated to be $47.25 per megawatt (MWh) hour or $0.047 per kilowatt-hour. (It is recognized that TMWA charged a higher rate ($56 MWh) based on the market conditions in 2002, but the COB Price Index was used to be consistent with the methodology defined in the Draft Agreement). The annual energy value was multiplied by the hydroelectric power generation to calculate a gross annual hydroelectric power revenue value.

Hydroelectric power generation is based on minimum bypass flows at the four run of the river power plants under each alternative. (See "Minimum Bypass Flow Requirements for TWWA's Hydroelectric Diversion Dams on the Truckee River" in this chapter.) Hydroelectric power generation data for Lahontan Dam was provided by TCID and other

[7] The electricity price index was selected based on previous TROA investigations.

sources were used to generate annual power estimates for each of the alternatives (Water Resources Appendix, Exhibit 12). The same per unit power value for the run-of-the-river hydroelectric powerplants was used to estimate the gross power revenue for the Lahontan Dam hydroelectric powerplants.

2. Threshold of Significance

For the gross revenue analysis on hydroelectric power generation on Truckee River run-of-the river hydroelectric powerplants, any loss in revenue was considered significant and would require compensation under section 7.A.6 of the Negotiated Agreement.

For the Lahontan Dam hydroelectric powerplants, since there are no water rights associated with hydropower generation, no compensation is considered for reduced gross power revenues. The surface water and hydroelectric power generation (Water Resources Appendix, Exhibit 12) and the economic analyses show little impact on hydroelectric power generation under No Action, LWSA or TROA.

3. Model Results

Table 3.101 presents average annual hydroelectric power generation and associated average annual gross revenues in wet, median, and dry hydrologic conditions.

Table 3.101—Model results for average annual hydroelectric power generation and average annual gross power revenues

Hydrologic condition	Current conditions	No Action	LWSA	TROA
Truckee River average annual hydroelectric power generation (MWh)				
Wet	67,829	67,750	67,750	67,447
Median	65,910	65,899	65,928	63,852
Dry	45,985	46,778	46,676	48,085
Truckee River average annual gross power revenue (millions $)				
Wet	3.20	3.20	3.20	3.19
Median	3.11	3.11	3.12	3.02
Dry	2.17	2.21	2.21	2.30
Lahontan Dam average annual hydroelectric power generation (MWh)				
Wet	26,837	25,948	25,948	25,948
Median	22,866	22,292	22,292	22,292
Dry	21,520	20,919	20,915	20,898
Lahontan Dam average annual gross power revenue (millions $)				
Wet	1.27	1.23	1.23	1.23
Median	1.08	1.05	1.05	1.05
Dry	1.02	0.99	0.99	0.99

4. Evaluation of Effects

a. No Action

Operations model results show that under current conditions, average annual hydroelectric power generation ranges from a high of 67,829 MWh in wet hydrologic conditions to a low of 45,985 MWh in dry hydrologic conditions and the associated average annual gross power revenue ranges from $3.2 million to about $2.2 million. Under No Action, average annual hydroelectric power generation ranges from a high of 67,750 MWh and low of 46,778 MWh, and associated average annual gross power revenues range from a high of $3.2 million to a low of about $2.2 million. Average annual hydroelectric power generation and revenues under No Action are about the same (less than 1 percent difference) as under current conditions in wet and median hydrologic conditions. In dry hydrologic conditions, average annual gross revenues under No Action are $40,000 or about 2 percent greater than under current conditions.

For Lahontan Dam, average annual hydroelectric power generation under current conditions ranges from 26,837 MWh in wet hydrologic conditions to 21,520 MWh in dry hydrologic conditions and associated average annual gross power revenues based on a value of $47.25 per MWh range from a high of $1.3 million to a low of about $1 million. Under No Action, average annual hydroelectric power generation ranges from 25,948 MWh to 20,919 MWh, and the associated average annual revenue ranges from $1.23 million to about $1.0 million. Average annual hydroelectric power generation and revenues under No Action are slightly less (approximately 3 percent) than under current conditions in wet, median, and dry hydrologic conditions.

b. LWSA

Average annual hydroelectric power generation ranges from a high of 67,750 MWh in wet hydrologic conditions to a low of 46,676 MWh in dry hydrologic conditions under LWSA. Associated average annual gross power revenues range from a high of $3.2 million to a low of about $2.1 million. Under LWSA, average annual hydroelectric power generation and revenues are about the same as under No Action in wet, median, and dry hydrologic conditions. Average annual hydroelectric power generation and revenues under LWSA are slightly less (less than 1 percent) than under current conditions in wet hydrologic conditions and slightly greater under median conditions. In dry hydrologic conditions, average annual hydroelectric power generation and revenues are 1.5 percent greater than under current conditions.

For Lahontan Dam, average annual hydroelectric power generation under LWSA ranges from 25,948 MWh in wet hydrologic conditions to 20,915 MWh in dry hydrologic conditions. Average annual hydroelectric power generation and gross revenue under LWSA are about the same as under No Action in wet, median, and dry hydrologic conditions; and about 3 percent less than under current conditions in all hydrologic conditions.

c. TROA

Average annual hydroelectric power generation ranges from a high of 67,477 MWh in wet hydrologic conditions to a low of 48,084 MWh in dry hydrologic conditions under TROA. Associated average annual gross power revenues in wet, median, and dry hydrologic conditions are $3.19 million, $3.02 million, and $2.30 million, respectively.

Average annual hydroelectric power gross revenues under TROA are about $13,000 or 0.4 percent, less in wet hydrologic conditions; $96,000 or 3.1 percent, less in median hydrologic conditions, and $62,000 or 2.8 percent, greater in dry hydrologic conditions than under No Action. They are about $17,000 or 0.5 percent, less in wet hydrologic conditions; $97,000 or 3.0 percent less, in median conditions; and $99,000 or 4.6 percent, greater in dry hydrologic conditions than under current conditions.

At Lahontan Dam, under TROA, average annual hydroelectric power generation ranges from a high of 25,948 MWh in wet hydrologic conditions to a low of 20,898 MWh in dry hydrologic conditions. Overall, there is little difference in average annual hydroelectric power generation and gross revenues (difference of less than 1.0 percent) between TROA and No Action in wet, median, and dry hydrologic conditions and the regional economy would not be significantly affected. Average annual hydroelectric power generation and revenues are approximately 3.0 percent less under TROA and No Action than under current conditions.

5. Mitigation

Reduced hydroelectric power generation at the Truckee River run-of-the-river hydroelectric powerplants, if any, resulting from implementation of TROA would be compensated consistent with the provisions of TROA 7.A.6. Because no water right is associated with hydroelectric power generation at Lahontan Dam, reduced hydroelectric power generation and revenues would not be compensated.

F. Annual Groundwater Costs

TMWA provided information on the maximum amount of groundwater that could be pumped in the Truckee Meadows in a year because of drought conditions and the associated costs (capital investments and production costs) for each of the alternatives considered in this EIS/EIR. (See Chapter 2, “Alternatives.”) The analysis in this section identifies those costs for each alternative and compares them to costs under No Action and current conditions.

1. Method of Analysis

For this study, TMWA provided maximum annual groundwater estimates and the associated annual production cost for each of the alternatives. Capital investments (construction of new groundwater pumps) over the study time period were also provided. The annual groundwater production costs are based on the amount of groundwater pumped and the acre-foot pumping cost. For example, if up to 15,950 acre-feet are

pumped, then the average pumping rate is about $91 per acre-foot. If 15,951 to 21,930 acre-feet are pumped, then the rate is $200 per acre-foot. From this rate structure, the maximum annual groundwater pumping costs can be estimated based on the amount of groundwater pumped and/or recharged under each alternative. The capital investment costs for new pumping systems were included in this analysis. These investment costs occurred in different times over the study period. These capital costs were present-valued to beginning of the study period and then calculated on an annual basis to be comparable to the annual groundwater production costs calculated earlier. This approach is consistent with standard planning procedures under the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Standards (Principles and Guidelines).

2. Threshold of Significance

Comparison of pumping costs among alternatives was used to evaluate significance; the least per acre foot cost is used to determine significance among the action alternatives.

3. Model Results

Table 3.102 shows calculated groundwater pumping costs under current conditions and the alternatives.

Table 3.102—Groundwater pumping (acre-feet) and development costs ($)

Indicator	Current conditions	No Action	LWSA	TROA
Maximum annual pumping	15,960	21,930	21,930	15,960
Drought year recharge	0	0	4,450	0
Total annual pumping	15,960	21,930	26,380	15,960
Total annual development costs	$1,520,395	$3,348,102	$4,696,483	$2,151,982
Cost per acre-foot	$95.26	$152.67	$178.03	$134.84

4. Evaluation of Effects

a. No Action

Under No Action, TMWA plans to pump an annual maximum amount of 21,930 acre-feet in Truckee Meadows, or 5,970 acre-feet more than under current conditions. The additional pumping costs and capital investments under this alternative would be $1.8 million (120 percent) more in total annual groundwater-related costs than under current conditions. The cost per acre-foot is $152.67.

b. LWSA

Under LWSA, TMWA plans to pump an annual maximum amount of 21,930 acre-feet per year in Truckee Meadows as well as recharge the groundwater by 4,450 acre-feet per year, or 4,450 acre-feet per year more than under No Action and 10,420 acre-feet per year more than under current conditions. The additional pumping costs and capital investments under this alternative would be $1.35 million more in groundwater-related costs than under No Action and $3.2 million more than under current conditions, or about 40 percent more than under No Action and about 200 percent more than under current conditions. The cost per acre foot is $178.03.

c. TROA

Under TROA, TMWA plans to pump a maximum of 15,950 acre-feet per year in Truckee Meadows, 5,980 acre-feet per year less than under No Action and the same as under current conditions. While the amount of groundwater pumping is the same as under current conditions, future capital investments increase the annual groundwater costs for this alternative, resulting in about $632,000 more (or 42 percent) in groundwater-related costs than under current conditions and $1.2 million less (or 36 percent) than under No Action. The cost per acre foot is $134.84.

5. Mitigation

No mitigation would be required under NEPA because no significant adverse effects would occur under any of the alternatives. CEQA does not require mitigation for economic impacts.

G. Additional Analyses

In response to comments received on the revised DEIS/EIR, additional analyses were conducted for this final EIS/EIR on the economic effects of five shortage years in a drought period—88, 90, 91, 92, and 94—on agricultural production in the Carson Division and on hydroelectric power generation at Lahontan Dam.

1. Carson Division Shortages and Agricultural Production

Operations model results show that, in the five shortage years, Carson Division shortages range from 56,310 to 145,640 acre-feet per year under current conditions; 70,250 to 158,290 acre-feet per year under No Action; 71,620 to 159,110 acre-feet per year under LWSA; and 70,170 to 158,090 acre-feet per year under TROA. (See figure 3.23 in Section F, “Exercise of Water Rights to Meet Demand” in “Surface Water.”)

Thus, in these years, compared to current conditions, Carson Division shortages are similar under the three alternatives, ranging from approximately 9.0 to 28.8 percent greater than under current conditions. Shortages such as these could result in smaller crop yields compared to current conditions which could, in turn, result in less production and gross crop revenues, depending on irrigation practices and market prices. For example, in recent drought years, particularly in 1992, while the number of irrigated acres

did not change substantially, crop yield (alfalfa hay) declined. It is difficult to determine the effect on the regional economy on the basis of these shortages. While such cumulative shortages may potentially affect individual irrigators and the irrigation district, the effect would not be significant (greater than 10 percent change in jobs or income) within the regional area.

As noted in Section F, "Exercise of Water Rights to Meet Demand" in "Surface Water," Newlands Project supplies from the Truckee River in the future are less than under current conditions because Carson Division demand is less and water rights in the Truckee River basin are more fully exercised. Effects would be similar under all the alternatives compared to current conditions. Compared to No Action, shortages are 0.5 to 2.0 percent greater under LWSA and 0.1 percent less under TROA. Such small differences in shortages among the action alternatives would not have a significant effect on the regional economy.

2. Carson Division Shortages and Lahontan Dam Hydroelectric Power Generation

Hydroelectric power generation data provided by TCID and other sources were used to generate average annual power estimates under each alternative (Water Resources Appendix). The same per unit power value ($47.25 per MWh) for the run-of-the-river hydroelectric powerplants was used to estimate the gross power revenue for the Lahontan Dam hydroelectric powerplants. The hydroelectric power generation data for the five Carson Division shortage years were obtained from operations model results. Table 3.103 shows Lahontan Dam average annual hydroelectric power generation and gross revenues in these years.

Table 3.103—Lahontan Dam hydroelectric average annual power generation and average annual gross revenues

	Shortage years in drought period				
	88	**90**	**91**	**92**	**94**
Average annual hydroelectric power generation (MWh/year)					
Current conditions	19,106.78	21,832.34	13,128.79	10,660.50	19,448.10
No Action	17,229.62	19,054.10	11,708.25	9,120.41	17,698.70
LWSA	17,162.84	18,965.61	11,667.86	9,045.40	17,582.46
TROA	17,152.95	18,942.01	11,816.75	9,041.19	17,564.32
Average annual estimated gross revenues ($47.25 per MWh)					
Current conditions	$902,795	$1,031,578	$620,335	$503,709	$918,923
No Action	$814,099	$900,306	$553,215	$430,939	$836,264
LWSA	$810,944	$896,125	$551,306	$427,395	$830,771
TROA	$810,477	$895,010	$558,341	$427,196	$829,914

Comparison of average annual hydroelectric power generation for the shortage years indicates gross revenues would be 9 to 15 percent less under the alternatives than under current conditions. The effect on the regional economy would not be significant because other sources in the regional power grid could provide additional required power. Analysis shows that average annual hydroelectric power generation and gross revenues would be slightly less under LWSA and TROA than under No Action (less than 1 percent), which should not significantly affect the profitability of TCID's hydroelectric power operations or the regional economy.

SOCIAL ENVIRONMENT

I. Affected Environment

This section provides an overview of the current social environment of the study area and describes aspects, including population and demographics, urbanization of Truckee Meadows, and air quality, which were identified by the public as social issues of concern.

A. Overview

For discussion and analytical purposes, the study area has been divided into five distinct components: Lake Tahoe basin, the Truckee River basin in California, Truckee Meadows, agricultural lands in the Newlands Project, and Indian lands.

1. Lake Tahoe Basin

The Lake Tahoe basin attracts residents and visitors because of its numerous recreational opportunities and proximity to the communities around Lake Tahoe and Truckee Meadows. While 85 percent of the Lake Tahoe basin is public land held by the Federal government and managed by USFS, 85 percent of the lakeshore is privately owned. Both California and Nevada maintain State parks in the basin; the largest is Lake Tahoe Nevada State Park on Lake Tahoe's eastern shore.

The 2000 Census estimated about 41,160 housing units in the Lake Tahoe basin. About 32 percent of these were owner-occupied, and 23 percent were renter-occupied; about 40 percent of total available housing—16,660 units—was for seasonal, recreational, or occasional use. Businesses in the Lake Tahoe basin provide goods and services to the tourism and recreation trade, plus the normal mix of community utility and health services, agricultural services, construction and maintenance businesses, and the stores and dealerships associated with any community.

Private lakeshore property owners historically have sought to maintain Lake Tahoe's water elevation and water quality to protect the lakeshore they own and to maintain the aesthetic appeal of the lake. The lake and its scenic surroundings are lures to recreationists and tourists. Other seasonal activities (skiing, camping) and year-round attractions (casinos and other entertainment) provide diversity. Residents and property owners are concerned with maintaining other quality of life factors throughout the basin. Development and use are tightly controlled by the Tahoe Regional Planning Agency. TRPA has broad regulatory authority over private land use and development as well as oversight control in areas such as zoning and water treatment requirements.

2. Truckee River Basin in California

Residents share the aesthetic and environmental concerns of residents closer to Lake Tahoe but generally are less affected by the immediacy of those issues. They also share the "quality of life" values which are characteristic throughout the study area. Many businesses depend on the diversity of tourism and recreational trade attracted to local reservoirs and lakes.

Of the 11,800 total housing units in the area, more than 80 percent are in Truckee, the largest city in the basin. More than 70 percent of the occupied housing was owner-occupied, according to the 2000 Census. Similar to the Lake Tahoe Basin, about 40 percent of the total available housing was for seasonal, recreational, or occasional use.

3. Truckee Meadows

Truckee Meadows, which contains the urban Reno-Sparks area, has evolved from a predominantly agricultural area to one of the fastest growing communities in the country. It is about 30 miles northeast of Lake Tahoe in central Washoe County, Nevada.

About 60 percent of the available housing in Truckee Meadows is owner-occupied, and about 40 percent is renter-occupied. Less than 1 percent of the housing is for seasonal, recreational, or occasional use. The area has an average per capita income of slightly more than $24,000. Reno-Sparks depends on the hotel, gaming, and entertainment industries and on the eating, drinking, and lodging businesses that support those enterprises.

Truckee Meadows residents are concerned with maintaining quality of life in the face of growing population and increasing demands on the environment and economy. The continuing transition from an agricultural to nonagricultural lifestyle has created demand for more urban water uses at the expense of rural/farm uses. Likewise, air quality and habitat were not issues 20 years ago but have become important contemporary issues. Consequently, the community has identified the following measures of quality of life: economic vitality, education, health, land use and infrastructure, natural environment, and public health and welfare (Truckee Meadows Tomorrow, 2003).

A heightened awareness of the relationship between environmental concerns and growth is reflected in the 2002 Truckee Meadows Regional Plan (Regional Plan) four planning principles: Regional Form and Development Patterns, Natural Resources Management, public services and facilities, and regional plan implementation. (Truckee Meadows Regional Planning Agency, 2003) These principles guide the goals and policies of the Regional Plan to encourage land use to promote responsible management of the region's air and water resources to attain and maintain Federal and State quality standards. The quality of life indicators and the Regional Plan suggest the community is interested in ensuring a diverse economy with a high standard of living without sacrificing the natural environment.

4. Agricultural Lands on the Newlands Project

This area includes Fernley, Fallon, and Naval Air Station Fallon.

When established in 1904, Fernley served travelers on the transcontinental railroad and highway. With the completion of the Truckee Canal in 1905, Fernley evolved into an agricultural center for the farmers served by the Newlands Project. Today, Fernley maintains its rural character but has targeted itself as a location for housing for commuters to Truckee Meadows, small industries, and retirement centers for senior citizens. Town planners believe the lower cost of land and the town's nonurban character appeal to these groups. While subdivided land and housing construction have attracted residents, Fernley's industrial sites are also attracting businesses. The community's residents exist in a delicate balance between enjoying a lower cost of living (compared to Truckee Meadows) and requiring expanded community services.

Agriculture continues to contribute substantially to the rural way of life and the local economy. Farms generate income for owners and laborers. As business enterprises, farms also make contributions in terms of operation and maintenance expenditures, investments in capital equipment, land improvements, and taxes paid on farm sales, purchases, and real estate, much of which is spent in the local economy. While many farmers on the Newlands Project value their way of life, some have chosen to sell their water rights and cease farming.

NASF was established as a naval auxiliary station in 1944 following the construction of a military airfield in 1942. It currently is the Navy's major training center for carrier-based aviators. It encompasses approximately 240,792 acres. While Churchill County's early growth and prosperity was founded in agriculture, the county now depends heavily on NASF, which accounted for about 40 percent of Churchill County's jobs (3,077 of 7,150) in 2001.

5. Indian Lands

Indian tribes in the study area include: Pyramid Lake Paiute Tribe: Pyramid Lake Indian Reservation (which includes Pyramid Lake) in Nevada; Reno-Sparks Indian Colony: Reno and Hungry Valley, in Nevada; Fallon Paiute-Shoshone Tribes: Fallon Paiute-Shoshone Reservation and Fallon Colony in Nevada; and Washoe Tribe of Nevada and California: colonies of Carson City, Dresslerville, Stewart, Washoe Ranch (in Nevada) and Woodfords (in California), Pine Nut allotments (in Nevada), and cultural interests at and near Lake Tahoe. See "Indian Trust Resources" for detail.

B. Population

To present a representative picture of the ethnic and racial composition of the study area population, the study area was divided into several areas: Lake Tahoe basin, Truckee River basin in California, Truckee River basin in Nevada, Truckee Meadows, Pyramid Lake, and lower Carson River basin. These areas have been further broken down by county and county subdivision. The number of persons accounted for in the 2000 Census

and percentages of population for five racial categories—(1) White, (2) Black or African American, (3) American Indian or Alaska Native, (4) Asian, and (5) Other (includes Native Hawaiian and Other Pacific Islander, Some Other Race, and Two or More Races)—are presented in table 3.104.

Table 3.104—Study area population, 2000[1]

	White	Black or African American	American Indian or Alaska Native	Asian	Other[2]	Total	Hispanic or Latino[3]
Lake Tahoe basin							
El Dorado County, California South Lake Tahoe Division/ CCD[4]	27,661	232	285	1,558	4,306	34,042	6,847
Placer County, California Lake Tahoe	10,434	54	116	129	1,425	12,158	2,432
Washoe County, Nevada Incline Village	9,053	46	59	156	638	9,952	1,207
Total	47,148	332	460	1,843	6,369	56,152	10,486
Percent of total	84.0	0.6	0.8	3.3	11.3	100.0	18.7
Truckee River basin in California							
Nevada County, California Donner Division/CCD[4]	12,853	35	86	121	1,397	14,492	1,793
Sierra County, California East Sierra Division/CCD[4]	2,350	7	46	3	95	2,501	163
Total	15,203	42	132	124	1,492	16,993	1,956
Percent of total	89.5	0.2	0.8	0.7	8.8	100.0	11.5
Truckee River basin in Nevada							
Lyon County, Nevada Fernley Division/CCD[4]	7,750	39	131	58	618	8,596	759
Storey County, Nevada Clark Division/CCD[4]	803	4	4	22	49	882	52
Washoe County, Nevada Verdi Division/CCD[4]	3,049	15	10	45	74	3,193	113
Total	11,602	58	145	125	741	12,671	924
Percent of total	91.6	0.5	1.1	1.0	5.8	100.0	7.3

Table 3.104—Study area population, 2000[1] – continued

	White	Black or African American	American Indian or Alaska Native	Asian	Other[2]	Total	Hispanic or Latino[3]
Truckee Meadows							
Washoe County, Nevada Flanigan Division[5]	48,426	900	1,232	1,315	4,183	56,056	5,430
New Washoe City Division[6]	10,912	39	79	129	285	11,444	405
Reno-Sparks Division[7]	200,356	6,092	3,540	12,875	33,352	256,215	48,780
Total	259,694	7,031	4,851	14,319	37,820	323,715	54,615
Percent of total	80.2	2.2	1.5	4.4	11.7	100.0	16.9
Pyramid Lake Division/CCD[4]							
Total	395	1	1,221	3	94	1,714	146
Percent of total	23.0	0.1	71.2	0.2	5.5	100.0	8.5
Lower Carson River basin							
Churchill County, Nevada Fallon Division/ CCD[4]	20,033	383	1,141	647	1,608	23,812	2,072
Total	20,033	383	1,141	647	1,608	23,812	2,072
Percent of total	84.1	1.6	4.8	2.7	6.8	100.0	8.7
Study area							
Grand total	354,075	7,847	7,950	17,061	48,124	435,057	70,199
Percent of grand total	81.4	1.8	1.8	3.9	11.1	100.0	16.1

[1] Source: 2000 Census of Population.
[2] Other includes remaining population who declared either as being of one race not listed on the chart or as being multi-race.
[3] As explained in the text, the Hispanic or Latino population may be of any race.
[4] In the 1990 Census, Division was used. In the 2000 Census, Census county division (CCD) was used. A CCD is a subdivision of a county that is a relatively permanent statistical area established cooperatively by the Census Bureau and state and local government authorities used for presenting decennial Census statistics.
[5] Washoe County division changes occurred from the 1990 to the 2000 Census. Flanigan County Division is now approximately represented by combining the North Valleys CCD and Warm Springs-Truckee CCD.
[6] Washoe County division changes occurred from the 1990 to the 2000 Census. New Washoe City Division is now approximately represented by the Washoe Valley CCD.
[7] Washoe County division changes occurred from the 1990 to the 2000 Census. Reno-Sparks Division is now approximately represented by combining the Sun Valley CCD, Sparks CCD, Reno North CCD, Reno SouthEast CCD, and Reno SouthWest CCD.

The numbers and percentages of the Hispanic or Latino population, a minority ethnic group, are also shown. Those identifying themselves as Hispanic or Latino may be of any race. Percentages were arrived at based on the numbers and totals of the subdivisions for each basin. While the actual population numbers may fluctuate somewhat, depending on seasonal and economic factors (more or fewer jobs related to tourism or farm labor, for example), the percentages shown provide a "snapshot" of the population in the study area.

The study area is overwhelmingly (more than 80 percent) White. The largest ethnic segment of the population is Hispanic or Latino, about 16 percent. All other groups combined make up less than 10 percent; American Indian or Alaska Natives comprise less than 2 percent. More detail regarding population in various parts of the study area follows.

Based on the 2000 Census, with a total population of 56,152 in 2000, the Lake Tahoe basin is about 84 percent White, 3 percent Asian, and less than 1 percent each Black or African American and American Indian or Alaska Native. The Hispanic or Latino ethnic group, which may come from any racial group, is the largest minority, with about 18 percent of the population. The overall population is well educated; more than 85 percent are high school graduates, and more than 20 percent hold bachelor's or advanced degrees.

The Truckee River basin in California has a population of 16,993 with about 90 percent White and less than 1 percent each American Indian or Alaska Native, Black or African American, or Asian in 2000. The Hispanic or Latino ethnic group accounts for about 12 percent. More than 80 percent are high school graduates, and more than 15 percent have bachelors or advanced degrees.

The Truckee Meadows population (323,715) is larger than that of all the other regions in the study area combined. It is also more diverse with a distribution of 80 percent White, 2 percent Black or African American, 1.5 percent American Indian or Alaska Native, and 4 percent Asian. The Hispanic or Latino ethnic group accounts for about 17 percent of the population.

The population (12,671) in the Truckee River basin in Nevada (generally north, east, and west of Truckee Meadows) has a racial distribution of 91.6 percent White, about 1 percent each American Indian or Alaska Native and Asian, and less than 1 percent Black or African American. The largest minority group is Hispanic or Latino ethnic, with about 7.3 percent of the population. In general, populations of the smaller agricultural communities along the river tend to be comprised of older residents; a growing community, Fernley is attracting younger people. The 2000 population of the Pyramid Lake Division was 1,714. The largest percent of American Indian or Alaska Natives in the study area, 71.2, is in this Division. The Division includes most of the Pyramid Lake Indian Reservation population. In the lower Carson River basin, Fallon's population was 7,536 in 2000, and 16,276 people lived in the area immediately around Fallon.

Table 3.105 presents change in population in different parts of the study area between 1990 and 2000; table 3.106 presents population and growth on Indian lands as of 2000; and table 3.107 presents the percent of urban population in the study area and the percent of urban change from 1990 to 2000.

C. Urbanization of Truckee Meadows

Truckee Meadows is experiencing rapid growth and developing a more urban character, particularly in Reno-Sparks. Consequently, TMWA is expected to acquire additional Truckee Meadows agricultural water rights to total 83,030 acre-feet and transfer these rights to municipal and industrial use. Existing groundwater rights also would be required for M&I use.

For example, in Washoe County, as many as 48,500 acres were irrigated in 1960. By 1990, 31,100 acres were irrigated. By 2020, only about 20,869 acres are projected to remain under irrigation. This trend is probably reflective of Truckee Meadows. Similarly, farm-generated income for the entire county reflects the decline of agriculture. While the number of irrigated acres and farm income ratios fluctuate on a year-to-year basis, the trend is the decrease of agriculture and the growth of nonagricultural businesses.

D. Air Quality

The 1970 Clean Air Act and its amendments provide the framework for all pertinent organizations to protect air quality. All states are required to show compliance with the National Ambient Air Quality Standards (NAAQS) or to develop control plans designed to achieve compliance with them. The rules and policies developed under these plans are codified in federally enforceable State Implementation Plans (SIPs) that are submitted to EPA for approval. Under Federal law, States are responsible for controlling stationary pollution sources and for insuring maintenance of motor vehicle pollution control devices.

California law delegates air pollution control authority to local air pollution control districts, primarily based on county boundaries. In the Lake Tahoe basin, the control responsibility for permitting stationary sources is held by El Dorado and Placer Counties.

Nevada has regulatory authority for air quality, except for delegation to its two most populated counties, Washoe (Reno-Sparks metropolitan area) and Clark (Las Vegas). In the Lake Tahoe basin, Nevada permitting authority is split between Washoe County and the State (acting in Carson City and Douglas County).

Under the Federal Clean Air Act, primary air quality planning authority is vested in the States. In California, the California Air Resources Board (CARB) acts as an intermediary between the local air quality agencies and EPA. Along with its authority to set environmental thresholds, TRPA has been granted a role in managing air quality through its transportation and land use management authority. Under this structure, El Dorado and Placer Counties, in consultation with TRPA, jointly develop a plan for the

Table 3.105—Study area population and growth rate, 1990–2000[1]

	1990 Population	2000 Population	Annual average growth rate 1990–2000 (percent)
Lake Tahoe basin			
El Dorado County, California South Lake Tahoe Division/CCD[2]	29,652	34,042	1.4
Placer County, California Lake Tahoe Division/CCD[2]	9,257	12,158	2.8
Washoe County, Nevada Incline Village Division/CCD[2]	7,567	9,952	2.8
Total	46,476	56,152	1.9
Truckee River basin in California			
Nevada County, California Donner Division/CCD[2]	9,420	14,492	4.4
Sierra County, California East Sierra Division/CCD[2]	2,029	2,501	2.1
Total	11,449	16,993	4.0
Truckee River basin in Nevada			
Lyon County, Nevada Fernley Division/CCD[2]	5,188	8,596	5.1
Storey County, Nevada Clark Division/CCD[2]	700	882	2.3
Washoe County, Nevada Verdi Division/CCD[2]	2,465	3,193	2.6
Total	8,353	12,671	4.3
Truckee Meadows			
Washoe County, Nevada Flanigan Division[3] New Washoe City Division[4] Reno-Sparks Division[5]	 790 10,109 231,651	 56,056 11,444 256,215	 5.3 1.2 1.0
Total	242,550	323,715	2.9
Pyramid Lake Division/CCD[2]			
Pyramid Lake Division/CCD[2]	466	1,714	13.9
Lower Carson River basin			
Churchill County, Nevada Fallon Division/CCD[2]	17,760	23,812	3.0
Study area total	327,054	435,057	2.9

[1] Source: 1990 and 2000 Census of Population.
[2] In the 1990 Census, Division was used. In the 2000 Census, Census county division (CCD) was used. A CCD is a subdivision of a county that is a relatively permanent statistical area established cooperatively by the Census Bureau and state and local government authorities used for presenting decennial census statistics.
[3] Washoe County division changes occurred from the 1990 to the 2000 Census. Flanigan County Division is now approximately represented by combining the North Valleys CCD and Warm Springs-Truckee CCD.
[4] Washoe County division changes occurred from the 1990 to the 2000 Census. New Washoe City Division is now approximately represented by the Washoe Valley CCD.
[5] Washoe County division changes occurred from the 1990 to the 2000 Census. Reno-Sparks Division is now approximately represented by combining the Sun Valley CCD, Sparks CCD, Reno North CCD, Reno SouthEast CCD, and Reno SouthWest CCD.

Table 3.106—Population of Indian lands

	1990 Population	2000 Population	Annual average growth rate 1990–2000 (percent)
Reno-Sparks Colony	724	881	2.0
Pyramid Lake Paiute Reservation	1,308	1,734	2.9
Fallon Paiute-Shoshone Reservation and Colony[1]	[2]758	743	-0.2

Source: 1990 and 2000 Census of Population.
[1] Fallon Paiute-Shoshone Reservation and Colony area was changed from the 1990 to the 2000 Census. It is now a combination of Fallon Paiute-Shoshone Colony and the Fallon Paiute-Shoshone Reservation and Off-Reservation Trust Land areas.
[2] Fallon Paiute-Shoshone Tribes, 1990. The 1990 Census showed a population of 546.

Table 3.107—Study area population percent urban and percent of urban change 1990–2000

	Population						Urban population	
	1990 Urban	1990 Total	1990 Urban	2000 Urban	2000 Total	2000 Urban	Change, 1990–2000	
	Number	Number	Percent	Number	Number	Percent	Number	Percent
Lake Tahoe basin								
El Dorado County, California								
South Lake Tahoe Division/CCD[1]	21,586	29,652	73	31,705	34,042	93	10,119	47
Placer County, California								
Lake Tahoe Division/CCD[1]	2,929	9,322	31	9,056	12,158	74	6,127	209
Washoe County, Nevada								
Incline Village Division/CCD[1]	7,119	7,494	95	8,051	9952	81	932	13
Basin total	31,634	46,468	68	48,812	56,152	87	17,178	54
Upper Truckee River basin (California)								
Nevada County, California								
Donner Division/CCD[1]	3,511	9,420	37	7,384	14,492	51	3,873	110
Sierra County, California								
East Sierra Division/CCD[1]	0	2030	0	0	2501	0	0	—
Basin total	3,511	11,450	31	7,384	16,993	43	3,873	110

Table 3.107—Study area population percent urban and percent of urban change 1990–2000 – continued

	Population						Urban population	
	1990 Urban	1990 Total	1990 Urban	2000 Urban	2000 Total	2000 Urban	Change, 1990–2000	
	Number	Number	Percent	Number	Number	Percent	Number	Percent
Lower Truckee River basin (Nevada)								
Lyon County, Nevada								
Fernley Division/CCD[1]	5,164	5,170	100	6,725	8,596	78	1,561	30
Storey County, Nevada								
Clark Division/CCD[1]	0	709	0	0	882	0	0	—
Washoe County, Nevada								
Verdi Division/CCD[1]	911	2507	36	1,994	3,193	62	1,083	119
Basin total	6,075	8,386	72	8,719	12,671	69	26,44	44
Truckee Meadows								
Washoe County, Nevada								
Flanigan Division[2]	0	882	0	47,929	56,056	86	479,29	—
New Washoe City Division[3]	2,932	10,113	29	3,503	11,444	31	571	19
Reno-Sparks Division[4]	212,880	231,605	92	253,014	256,215	99	25,3014	119
Basin total	215,812	242,600	89	304,446	323,715	94	88,634	41
Pyramid Lake Division								
Pyramid Lake Division/CCD[1]	0	1,451	0	587	1,714	34	587	—
Basin total	0	1,451	0	587	1,714	34	587	—
Lower Carson River Basin								
Churchill County, Nevada								
Fallon Division/CCD[1]	6,438	17,776	36	15,337	23,812	64	8,899	138
Basin total	6,438	17,776	36	15,337	23,812	64	8,899	138
ALL BASINS EXCEPT RENO-SPARKS	50,590	317,136	16	132,271	178,842	74	81,681	161
ALL BASINS	263,470	328,131	80	385,285	435,057	89	12,1815	46

Source: 1990 and 2000 Census of Population.
[1] In the 1990 Census, Division was used. In the 2000 Census, Census county division (CCD) was used. A CCD is a subdivision of a county that is a relatively permanent statistical area established cooperatively by the Census Bureau and state and local government authorities used for presenting decennial census statistics.
[2] Washoe County division changes occurred from the 1990 to the 2000 Census. Flanigan County Division is now approximately represented by combining the North Valleys CCD and Warm Springs-Truckee CCD.
[3] Washoe County division changes occurred from the 1990 to the 2000 Census. New Washoe City Division is now approximately represented by the Washoe Valley CCD.
[4] Washoe County division changes occurred from the 1990 to the 2000 Census. Reno-Sparks Division is now approximately represented by combining the Sun Valley CCD, Sparks CCD, Reno North CCD, Reno Southeast CCD, and Reno Southwest CCD.

Lake Tahoe Air Basin (LTAB) encompassing the California portion of the Lake Tahoe basin; that plan is then subject to CARB and EPA approval. In Nevada, TRPA cooperates directly with the State and Washoe County in the development of their respective plans.

The baseline air quality standards for the study area are the NAAQS for the federally designated criteria pollutants: particulate matter (PM_{10}), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb). California has adopted more stringent standards for the same criteria pollutants, as well as additional standards for sulfates, hydrogen sulfide (H_2S), and visibility-reducing particles (VRP). The State standards include special provisions for even lower permissible levels of CO and VRP for the California portion of the LTAB. Nevada also has adopted more stringent standards applicable in the Lake Tahoe basin, matching the California LTAB standards for CO and visibility and cutting the one-hour maximum ozone standard to equal California's statewide standard. Under the federally chartered bi-state compact that created TRPA, the authority to determine environmental thresholds to protect various resources was granted to TRPA. TRPA's thresholds for visibility and CO are essentially the same as the California and Nevada State standards.

Currently, the California portion of the Lake Tahoe area is classified as being in attainment or "unclassified" for all applicable standards except the California standard for PM_{10}, for which it is designated as being in nonattainment. Since 1990, the Nevada portion of the Lake Tahoe area had been identified as being in nonattainment for CO. However, in 2003 Nevada requested EPA to redesignate the Lake Tahoe Nevada area "not classified" CO nonattainment area to attainment for the CO NAAQS and submitted a CO maintenance plan for the area as a revision to the Nevada SIP. EPA approved the maintenance plan and redesignated the Lake Tahoe Nevada nonattainment area to attainment as of February 13, 2004 (68 FR 69611-69618, December 15, 2003).

In Washoe County, the Truckee Meadows hydrographic area is designated as being in nonattainment for CO with a classification of "moderate" since 1990, while the Reno planning area (hydrographic area 212) is designated as being in nonattainment for PM10, with a "serious" classification since 2001. The Fernley area and Truckee Meadows are designated as not meeting primary standards for total suspended particulate. Since 2001, the Reno area has been designated as being in nonattainment for the one-hour ozone standard (40 CFR 81.329). All other counties in the study area are in attainment for the designated air quality criteria pollutants.

EPA has devised a health-based scale of the NAAQS called the Air Quality Index (AQI), formerly called the Pollution Standard Index (PSI). The pollutants are considered unhealthful at a concentration over 100 on the AQI. Since 1990, there has been a general increase in "good" days (AQI of 0-50) and decreases in "moderate" (AQI 51-100) and "unhealthful" (AQI over 101) in Truckee Meadows. The overall decline in violations may be attributed in part to the weather, but it is also due to the use of oxygenated fuels

in the winter months, the vapor recovery program for gasoline dispensing facilities, restriction on residential wood burning, Federal emissions limitation on new cars, and vehicle inspection and maintenance requirements (Washoe County, 2003).

II. Environmental Consequences

A. Introduction

Modifying operations of Truckee River reservoirs could affect the storage and water elevations of lakes and reservoirs and the quantity, quality, timing, and duration of flows, which could indirectly affect the social environment.

This analysis evaluated the effects of changes in reservoir storage and water elevations and flows on the social environment using the following indicators:

- Population
- Urbanization of Truckee Meadows
- Air quality

B. Summary of Effects

Overall, effects on the social environment indicators of population, urbanization of Truckee Meadows, and air quality under TROA and LWSA would be the same as under No Action.

In the future, under all alternatives, the study area is projected to experience a steadily increasing population, an expansion of M&I water use, and a decline in agricultural-based living. Between 2000 and 2033, the population of Truckee Meadows is projected to increase from 284,147 to 440,874. Under No Action and LWSA, about 13,400 acre-feet of agricultural water rights, and, under TROA, an additional 12,000 acre-feet would be acquired and transferred to M&I use in response to increasing population until demand in the Truckee Meadows service area reaches 119,000 acre-feet. Local and State governments would continue to implement regulatory and monitoring programs to maintain compliance with air quality standards. Table 3.108 summarizes these effects.

C. Population

The population indicator is used to access potential burdens placed on community infrastructure (e.g., transportation, fire and police protection, schools, recreation facilities, etc.). If the population indicator is not significantly affected, further in-depth analysis of other more detailed indicators is not necessary.

Table 3.108—Summary of effects on the social environment

Indicator	Current conditions	No Action	LWSA	TROA
Population of Truckee Meadows	284,147	440,874	440,874	440,874
Urbanization of Truckee Meadows	M&I water supply of 83,140 acre-feet Baseline employment: 267,689 jobs Baseline income $15.2 billion	Change in M&I water supply to meet additional 36,000 acre-foot demand (total 119,000 acre-foot demand) would support 74,400 full- and part-time jobs and $2.56 billion in personal income	Same as under No Action	About the same as under No Action (differences in employment and income of less than 1 percent from baseline)
Air Quality	Regulatory programs and monitoring in place to comply with air quality criteria standards	Same as under current conditions	Same as under No Action	Same as under No Action

1. Method of Analysis

Future population levels and water demands used in this EIS/EIR are based on projections made by State and regional service and planning entities responsible for planning for M&I water supply and demand in the Lake Tahoe and Truckee River basins.

2. Threshold of Significance

The average annual growth rate for the Washoe County area served by TMWA (1.3 percent) was calculated from projections provided by TMWA (attachment C). Any difference from this rate was considered significant.

3. Evaluation of Effects

a. No Action

In general, the study area is projected to experience a steadily increasing population, M&I expansion, and a decline in agricultural-based living. Simply put, the future under No Action is expected to include more people coming to the study area to live an urban/suburban lifestyle and fewer people continuing to make an agricultural living.

The Washoe County growth rate is consistent with the growth anticipated throughout the region and within the study area. An annual growth rate average of 1.3 percent is estimated for the Washoe County area served by TMWA under the alternatives. This growth rate results in a projected population increase in the study area from 284,147 to 440,874 between 2000 and 2033.

With consistent population growth, the region is expected to face a wide range of predictable growth-related issues and problems. Population increases require an increase in local services, such as schools and hospitals, police and fire fighting capabilities, and community utilities, such as sewage, water supplies, and power. In general, regional and community planning is designed to keep pace with growth.

The projected increase in population also brings with it certain unavoidable conditions and issues associated with the environment. Development of new housing and business communities in the region may affect scenic and recreation values. All of the social benefits and disadvantages that accompany growth and development could change the character of the natural environment. The degree to which environmental change occurs can be controlled by regulation and planning.

b. LWSA

Because population growth under LWSA is projected to be the same as under No Action, effects on population in the study area would be the same as under No Action.

c. TROA

Because population growth under TROA is projected to be the same as under No Action, effects on population in the study area would the same as under No Action.

4. Mitigation

No mitigation would be required because no significant adverse effects would occur under any of the alternatives.

D. Urbanization of Truckee Meadows

1. Method of Analysis

The effects on urbanization of Truckee Meadows were quantified by evaluating the effect on population associated with changes in water supply, including the transfer of agricultural water rights to M&I use, as discussed in "Economic Environment." Population is not the only indicator of urbanization of Truckee Meadows, but it provides some perspective on relative differences among the alternatives.

The economic model calculated the amount of employment and income that could be supported by the 36,000 acre-foot increase in M&I water supplies from current conditions to meet the 2033 M&I demand of 119,000 acre-feet. The economic model then calculated employment and income and associated population that could be supported by the increase in M&I supplies. The economic model also calculated the effect of transferring agricultural water rights in Truckee Meadows on regional employment and income.

2. Threshold of Significance

The same threshold of significance was used as for "Population."

3. Evaluation of Effects

a. No Action

M&I water supplies in Truckee Meadows are expected to increase in the future, from approximately 83,140 acre-feet under current conditions to 119,000 acre-feet under No Action (increase of approximately 36,000 acre-feet). Economic model results show that this increase in M&I water supplies supports approximately 74,400 full- and part-time jobs and $2.6 billion in personal income, associated with a population of about 120,400.

In the past, agricultural lands in Truckee Meadows area have been converted to urban uses, resulting in less water available for agriculture and more water available for M&I and other water uses. The operations model assumes that, under No Action, irrigation water demand will be reduced by 13,368 acre-feet through additional purchases of agricultural water rights in Truckee Meadows.

The economic model estimates that the transfer of agricultural water rights in Truckee Meadows under No Action results in about 131 fewer jobs, resulting in about $2.4 million less in income, and about 212 fewer persons than the baseline regional economy. These differences are less than 1 percent and are considered negligible.

In the future, existing groundwater rights also would be acquired to increase use of groundwater supplies for M&I use.

b. LWSA

Under LWSA, the same amount of water would be allocated for M&I use as under No Action. Changes in employment, income, and population due to transfers of agricultural water rights would be the same as under No Action.

c. TROA

In Truckee Meadows, 25,367 acre-feet of agricultural water rights would be purchased and transferred under TROA. As a result, the economic model estimates 138 fewer jobs and $2.5 million less in personal income under TROA than under current conditions, and 83 fewer jobs and $1.42 million less in personal income than under No Action, or less than a 1 percent difference from baseline employment (267,689 jobs) and income ($15.2 billion) for the Nevada portion of the study area. Because these differences are less than 1 percent of the baseline regional economy, the effects would be negligible. Also, as discussed under "Economic Environment," the benefits resulting from the transfer of agricultural water rights to meet future demands for M&I, water quality,

recreation, and fish and wildlife habitat should be greater than the projected reduction in employment and income associated with the reduction of water rights for agricultural production.

4. Mitigation

No mitigation would be required because no significant effects would occur under any of the alternatives.

E. Air Quality

1. Method of Analysis

This analysis used information from EPA, the Air Quality Management Division of the Washoe County District Health Department, and the Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Air Quality Planning.

2. Threshold of Significance

For this indicator, any violation of air quality standards was considered significant.

3. Evaluation of Effects

a. No Action

Air quality in the Truckee Meadows area may be affected by increased automobile and manufacturing emissions. However, continuing reservoir operations in their existing pattern would not contribute to air quality problems.

Although the population is projected to increase and pollutant sources will also increase, it is expected that existing Federal, State, and/or local programs to safeguard air quality will be enhanced to cope with these changes. Monitoring programs are expected to continue, as well as the existing public education programs and rigorous enforcement of regulations. Other options and programs will be considered to deal with changing conditions when and if they become necessary. Over the period of analysis, it is difficult to assess what measures and quality levels might be in effect or attained. However, continued concern and high values placed on healthy air quality (as evidenced by present programs) indicate that this area's air quality will remain a respected and cared for resource. Continued action by Federal, State, and, especially, local county managers and planners is anticipated.

Reservoir operations, as proposed under No Action, would not affect air quality when compared to current conditions.

b. LWSA

No identifiable population impacts, changes in transportation patterns, or identifiable point source pollution impacts would be caused by LWSA; thus, LWSA would not contribute to any changes in air quality. Effects on air quality in Truckee Meadows would be the same as under No Action.

c. TROA

No identifiable population impacts, changes in transportation patterns or identifiable point source pollution impacts would be caused by TROA; thus, TROA would not contribute to any changes in air quality. Effects on air quality in Truckee Meadows would be the same as under No Action.

4. Mitigation

No mitigation would be required because no significant effects would occur under any of the alternatives.

CULTURAL RESOURCES

Cultural resources, the remains of past human activity, are finite, nonrenewable, and often fragile. These resources encompass a broad range and can include specific places associated with traditional ceremonies; artifacts, structures, object, or buildings; and landscapes associated with a period of time, a person, or historic movements. Federal agencies are required to identify and evaluate the significance of cultural resources located within the area of potential effect (APE) of any Federal undertaking.

Federal agencies' responsibility to consider and protect cultural resources is based on a number of Federal laws and regulations. (See Chapter 5, "Consultation and Coordination.") In particular, the National Historic Preservation Act of 1966, as amended (NHPA), and its implementing regulations for section 106, set out the requirements and process to identify and evaluate cultural resources, assess effects to these resources, and mitigate effects to significant resources which occur as a result of the agency's permitted undertaking. Under section 110 of NHPA, the responsibility of the Federal agency that owns or formally manages land includes identifying and managing the cultural resources on that land, even when there is no new undertaking.

The California Environmental Quality Act also requires consideration and protection of historical and archaeological resources listed in, or determined to be eligible for listing in, certain local registries, the California Register of Historic Resources, and the National Register of Historic Places. CEQA provides that a substantial adverse change to a resource listed or eligible for listing in the specified registries is a significant effect on the environment. Recent follow-up research to the previous DEIS/EIR considered all recent California and local registry cultural resource information within and immediately adjacent to the primary study area to assure that the analysis included all resources to which CEQA applies. And, although Nevada has no specific State requirements regarding environmental analysis of cultural resources similar to NEPA or CEQA, the same followup procedures (checking recorded cultural resources listed by the State register, then corroborating this information with the most recent National Register information available) were done for all Nevada counties within the primary and secondary study areas.

I. Affected Environment

This section summarizes known cultural resources in the area of potential effect and the level of survey conducted to date to identify them as a basis for impact analysis. The vast majority of these sites have not been evaluated for eligibility in the National Register of Historic Places (NRHP). Clearly, the list is incomplete for areas in which no or limited identification efforts have taken place.

A. Definition of Study Area

The Cultural Resources Appendix describes the general settlement and use through time of the study area (location map) and concludes with a list of the types of cultural resources sites that could be expected to occur as a result of this use. The geographic area defined for discussion of existing conditions and alternative analysis is more restricted. Cultural resources that fall near or below maximum monthly elevation of lakes and reservoirs or streams may be affected by submergence or by fluctuations in the elevation, particularly by the resulting erosion (or, in some cases, deposition) of soil in the area of the site. A range of human activities that occur near the edge of the water surface may also affect sites. For examples, see discussion in Nesbitt et al. (1991).

Thus, the critical factors in determining the areas to be considered in the evaluation of potential effects on cultural resources are the maximum monthly elevation and the fluctuation of that elevation in a lake or reservoir, and the maximum monthly flow in the river or its tributaries associated with operating system requirements. The affected areas, referred to collectively as the "primary study area" include (1) the land covered by the maximum water surface, plus a band of up to 200 yards around the perimeter (exact width depends on the terrain and use of the water body) of all system lakes and reservoirs: Lake Tahoe, Donner Lake, Prosser Creek Reservoir, Independence Lake, Stampede Reservoir, and Boca Reservoir; (2) a corridor of approximately 200 yards on either side of the Truckee River for its entire length from Lake Tahoe to Pyramid Lake; (3) similar corridors for stretches of drainages between reservoirs or to the Truckee River; and (4) the land up to the 3,900-foot elevation at Pyramid Lake. The primary study area is greater than the area within which impacts are expected.

The "secondary study area" for this revised DEIS/EIR includes a perimeter of approximately 200 yards around Lahontan Reservoir.

B. Data Sources

In preparing this section and the Cultural Resources Appendix, the following types of sources were consulted: a number of technical reports on small (and a few larger scale) archeological surveys and literature searches, reports on or references to testing or excavation of sites in or near the primary area, general and specific historical and ethnographic works, historic maps, Reclamation project information, USGS data and staff, flood reports, and site locational data obtained from a number of sources.

It is possible that, despite these substantial efforts, data gaps may occur in site information. These gaps, however, are not believed to affect the overall presentation of impacts and recommendations. Also, properties and sites *eligible* for NRHP are not included in the discussions or tables because very few exist within the study areas, and all occur in locations that would not be affected under any alternative.

A Truckee River-focused historic timeline and bibliographies of relevant historical and archeological sources for both study areas are included in the Cultural Resources Appendix.

The amount and level of detail of site information available for portions of the primary area vary greatly. For example, some Truckee River stretches in which development has taken place (Truckee and Reno/Sparks) have been completely surveyed, even more than once, while other portions (from the Little Truckee River to the State line) have had little to no attention. In some cases, site locations were recorded on 15-minute or 30-minute quadrangles (the best available at the time of survey) or with sketch maps, and exact site location is now uncertain. Sites are known to exist in some areas but have not been recorded. In other cases, while thorough surveys have been completed, final reports have not, and specific information is not available.

In addition, State records centers are in the process of converting archeological and historical site data from hand-plotted maps to computerized GIS layered plotting. In the interim, all site locations obtained from all sources have been plotted as exactly as possible on the appropriate 7-1/2-minute USGS quadrangle. The 264 sites around lakes and reservoirs and the 161 sites along various river reaches are listed in the Cultural Resources Appendix in specific table(s) labeled "CRA.2-(facility or reach)." And, the 77 sites (Historic Properties) in the primary and secondary study areas formally listed in the NRHP are presented in tables CRA.3-A (California) and CRA.3-B (Nevada). (Map 3.1 shows the reaches of river used in this analysis.)

The discussion of known cultural resources within the primary study area begins at Lake Tahoe and extends to Pyramid Lake; the cultural resource discussion for the secondary study area includes Lahontan Reservoir. For each lake or reservoir and reach of river or major tributary, there is a summary description of the amount and level of inventory completed (when known) and a summary of the types of sites recorded. Most of the historic properties listed in tables CRA.3-A and CRA.3-B lie within the limits of a few communities along the Truckee River; discussion of these properties is limited.

C. Cultural Resources in the Study Areas

1. Lake Tahoe

The lands surrounding Lake Tahoe are managed by the Lake Tahoe Basin Management Unit of the U.S. Forest Service, California State Parks and Recreation, and by the TRPA, which oversee development of private and public land. Reclamation holds title to Lake Tahoe Dam. Cultural resource surveys of most of the Federal lands in the primary area have been completed. The amount of survey work completed on State and private land is unclear but substantial.

Prehistoric sites recorded within the primary area include the following: large and small prehistoric base and temporary campsites, 11 with only hunting material (e.g., flakes, projectile points, scrapers), primarily of basalt with occasional obsidian, and 13 with only milling or grinding features.

Sixteen ethnographic sites include ones identified as fishing or resting places, mortars, a cemetery, and a campsite associated historically with a particular family. A variety of historic sites include 18 with foundations and/or structures, some with trash dumps and one with a well; 20 separate trash dumps; eight road and three railroad alignments; a power line; two sawmills; two logging locations; nine dams, ditches, flumes, and other water control structures, either separate or part of other sites; and a cemetery. Three sites are of unknown type, and two are rock alignments of unknown age. Many of the sites, some recorded in the 1950s, are reported to be badly disturbed and in areas of development.

In addition to these formally recorded sites, a knowledgeable avocational archeologist, Charles E. Blanchard, documented a large number of probable or actual prehistoric and historic sites during a September 1988 survey. Blanchard conducted the survey on foot and by canoe during a period of extreme low water, and plotted the locations around the shoreline on USGS quadrangles. No elevations are available, but the majority of sites are assumed to lie between 6229 feet (maximum elevation under the Truckee River Agreement of 1935) and 6223 feet, the natural rim of the lake. As no cultural material has been recorded on the exposed land above elevation 6230 feet that correlates with these locations, the extent of remaining material within the pool is unknown.

The resources include the following: 30 possible and 13 definite bedrock mortars or slicks, plus one with a possible minnow trap; 31 definite and two possible rock alignments, cairns, and jetties (prehistoric and historic); 20 prehistoric lithic scatters, and one described as protohistoric with flaked glass; three definite fishing-related sites (traps), plus one natural formation that may have been used as a trap; 58 log or rock dock remains (including pilings); 14 historic house or building remains, plus a round log sea wall; 12 areas of historic trash, plus one with only historic ceramics; three definite or possible quarries; nine sites with rails or railroad alignments; one rock shelter; one logging related site, and 34 examples of modern construction added to historic log cribbing.

Tahoe Dam and Outlet Works and the Gatekeepers Cabin are listed in NRHP as a part of the historic Newlands Project, America’s first Bureau of Reclamation project.

Of the 109 sites listed in the Cultural Resources Appendix (table CRA.2-Lake Tahoe), 19 extend to the beach (at elevation of approximately 6230 feet) or lie on the beach along or near the water‘s edge. Three sites are described as going into the water. Two others are described as possibly going into the water but are at elevation 6230 feet. One site is described as in the water near the beach (elevation 6225 to 6230 feet).

No sites along the beach (but not in the water) are directly affected by the current maximum elevation of 6229 feet. These may well be affected by wave action. (See "Sedimentation and Erosion.")

The lake's minimum elevation was 6220 feet (November 1993), so most of the sites noted by the foot and canoe survey appear to fall in the area between elevation 6229 and 6223 feet and are clearly subject to the effects of fluctuation. Sites reported in shallow water at that time would normally be submerged all year.

2. Truckee River: Lake Tahoe to Donner Creek

Lands along this reach of the Truckee River lie within the Tahoe National Forest Truckee Ranger District and the Lake Tahoe Basin Management Unit. One site is recorded in the Lake Tahoe Basin Management Unit portion.

Cultural resources surveys along this reach include some early general investigation and more recent compliance work along utility corridors and for timber sales and commercial development, resulting in intense coverage for some portions and limited or no coverage for others. In particular, a number of sites are recorded in the deltas or on terraces overlooking the confluence of tributary streams and the river.

Forty-three sites have been recorded on this reach, including prehistoric sites with only material associated with hunting, sites with milling material, and sites with both hunting and milling cultural material. Four of these prehistoric sites also include a limited amount of historic material. Among the historic materials are trash scatters, a railroad alignment, town sites, a mine and tailing pile, a rock ring hearth, a hobo camp, and a Basque tree carving.

3. Donner Lake

The resources of Donner Memorial State Park, which arcs around the east and southeast end of the lake, have been defined. As part of a statewide management program, the park's cultural resources, previously identified and newly discovered, were documented and organized into one general site with several loci of activity (Nesbitt, 1990). Survey of portions of the remainder of the perimeter of the lake, much of which is private land, has been limited to areas associated with development and recreation management; the extent is not known at this time. Much of the area within the primary area on the north side of the lake has been disturbed by historic and recent infrastructural/industrial development.

Within Donner Memorial State Park, the following resources have been defined: two prehistoric lithic scatters, one large and one small; the locations of the historic Murphy and Donner cabin sites; material possibly associated with the historic 1864-66 and slightly later development; and a possible Chinese habitation site.

Two other prehistoric sites have been recorded on the south and west ends of the lake. The one on the west end, originally recorded in 1953, is an extensive scatter of thousands of basalt flakes and a number of tools; the other is a smaller basalt lithic scatter. Two known sites are affected by fluctuating elevation.

In their November 1988 survey of areas of the Donner Memorial State Park exposed by low lake elevations, archeologists from the California Department of Parks and Recreation (CDPR) examined a large lithic scatter which extends downslope to elevation 5933 feet. The site was said to be affected by fluctuating elevations, particularly at elevation 5936 feet (Woodward, 1991).

Another site is shown extending downslope along the beach to the maximum elevation; it is not known if the site extends below elevation 5936 feet. If it does, that portion is affected by fluctuating elevation.

4. Donner Creek: Donner Lake to Truckee River

Survey of the area downstream from Donner Memorial State Park has been limited to relatively small areas associated with aspects of development such as utility corridors, highways, and housing.

Four prehistoric sites have been recorded with extensive basalt and lithic scatters and midden (trash pile). One undefined site (possible Pioneer Village #1, and not listed) is noted near the confluence of Cold Creek and Donner Creek. Some of the features of cultural resources sites which are within Donner Memorial State Park and lie along Donner Creek are discussed under Donner Lake.

5. Truckee River: Donner Creek to State Line

Although it is not entirely clear from USGS quadrangles, much of the primary study area along this reach of the river appears to be private land. Surveys of this segment are associated with highway rights-of-way and development and include linear alignments and small and medium size blocks; 40 percent of the area has been surveyed.

Most of the 26 recorded sites are located upstream of the confluence of Prosser Creek and the Truckee River. The prehistoric sites of varying sizes which have been recorded include the following: six basalt flake scatters, some with tools; a flake scatter with obsidian and jasper as well as basalt material; and a campsite with house rings, flakes and points, one lithic scatter, and a shallow midden. Three of the prehistoric sites also have historic materials, including an historic ice company facility and associated debris and a hotel and “historic ruin.” The other historic site is the location of the Tahoe Ice Company. One recorded protohistoric and historic Washoe Camp is located along the river at Truckee. The material of three remaining plotted sites is unknown.

The site downstream from the confluence of Prosser Creek and the Truckee River is the Boca Brewery, located on the south side of the Truckee, slightly west of the Little

Truckee. Speer (1984) estimated that 10 to 25 percent of the archeological deposit from the brewery's 1893 demise remained. Recent surveys have concentrated on areas within Truckee city limits, as well as the Farad Powerhouse site.

Additionally, two historic sites between Boca Dam and the Truckee River include the Boca townsite (both sides of the Little Truckee River) and a Civilian Conservation Corps camp used during the dam's construction.

6. Prosser Creek Reservoir

Based on the Memorandum of Agreement executed in 1970 transferring project lands to USFS under the Federal Water Project Recreation Act, lands other than those managed by Reclamation and below elevation 5741 feet are the property of and managed by the Forest Service, which has recorded sites in the primary area. Extent of USFS's reservoir perimeter survey to identify cultural resources is not known, but based on copies of USFS maps, it is estimated to be less than 15 percent.

In August 1957, an intensive but unsystematic survey of the proposed Prosser Creek Reservoir area was conducted to locate "sites of archeological importance" (Elsasser, 1957:1). On the forms for the sites recorded, location is referenced to the Truckee 30-minute quadrangle, by quarter-quarter section; all elevations are given as 5800 feet. Elsasser notes that sites were plotted to the nearest 100-foot contour line and that "sites which might be flooded sometimes appear as being above the expected pool elevations of the reservoirs" (Elsasser, 1957:2). Plots for these sites on 15-minute quadrangles by the site repository do not always match the description and location on the site form. Notes on site forms indicate that certain sites will or may be flooded by the dam's construction. Best judgment has been used as to which sites are below or above the maximum elevation. Two of the 16 sites recorded in the Prosser Creek drainage by the 1957 survey were tested before construction. One of these appears to be outside the primary study area.

Twenty-eight sites have been recorded. These sites include prehistoric basalt flake and flake and tool scatters, one historic campsite with prehistoric lithic material, one lithic scatter, and one lithic scatter with ground stone. One site of unknown type has been recorded by non-USFS work.

7. Prosser Creek: Prosser Creek Reservoir to Truckee River

The amount of survey conducted along this stretch of the river is unknown; USFS may have surveyed a portion. One small prehistoric campsite recorded in the general vicinity may be located in the primary study area.

8. Independence Lake

The extent of professional cultural resources survey around the perimeter of privately owned Independence Lake is unknown but appears to be very limited. The reliability of the results of surveys by State Forest technicians is unknown. Four sites have been recorded around the lake. Two sites (for which accurate site information is available)

include locations with Basque tree carvings and a basalt flake scatter. The location of the third site, a prehistoric temporary camp, is unknown. Given the slopes of the valley, the presence of numbers of sites, other than perhaps in the valley floor along the creek beneath the lake, seems unlikely.

9. Independence Creek: Independence Lake to Little Truckee River *and* Little Truckee River: Independence Creek to Stampede Reservoir

Downstream from Independence Lake dam, six sites have been recorded near Independence Creek: the remains of a waterwheel and flume, the circa 1915–18 logging camp of the Hobart Estate Company, two basalt flake scatters, as well as the Henness Pass Road and the old Holcomb Dairy. Only one historic site, a berm, has been recorded on the Little Truckee River stretch between Independence Creek and Stampede Reservoir, and it was deemed not eligible for inclusion on the National Register (Wallner, 1996.) No elevation is available for this site.

10. Stampede Reservoir

In 1957, A.B. Elsasser and P.J.F. Schumacher recorded seven sites in the area later inundated by construction of Stampede Reservoir; the intensity and extent of the survey are unknown. Two additional sites, recorded in 1958 and 1966, were intensively investigated in 1967 by Payen and Olsen. CDPR archeologists and historians have recorded two sites (Nesbitt, et al., 1991), and USFS has recorded five sites within the inundation area. One other site, recorded in 1967, may lie within the inundation area.

Lands surrounding Stampede Reservoir, except those managed by Reclamation, are part of the Tahoe National Forest, which has recorded sites in the primary study area. Based on USFS maps, perhaps 10 percent of the perimeter of the lake has been formally surveyed, plus a small additional area above elevation 6000 feet.

The 26 sites recorded within the primary study area include prehistoric occupation areas; prehistoric basalt flake and flake/tool scatters of differing extent and intensity; prehistoric sites described as lithic scatters; sites with lithic scatters and milling features, sites whose types are unknown, and the Boca and Loyalton Railroad segment. At one of the prehistoric sites originally recorded as a flake scatter, more than 100 projectile points and large quantities of ground stone artifacts were discovered during excavation. The second excavated site was a large circular stone enclosure, which yielded a small number of projectile points and other tools. In addition to the historic Smith Mill, four of the prehistoric sites have historic materials, largely trash scatters.

Eighteen sites are known near or below the maximum elevation of Stampede Reservoir. Two sites were partially excavated in 1967 and may require no further attention.

11. Little Truckee River: Stampede Reservoir to Boca Reservoir

Eleven sites have been recorded on this stretch of the Little Truckee River. Site information and the usually small, discrete areas surveyed recorded on USFS atlas sheets form the basis of the discussion.

Recorded prehistoric sites include six flake and tool scatters and two others with flaked and ground stone. One is a historic weir on the Little Truckee River. Historic sites include one historic settlement with structural features, debris, railroad bed, trash scatters, and a segment of an emigrant trail. All three historic trash scatters occur at prehistoric sites. Two sites are not defined on the site forms. All except a segment of the California route of the Overland Trail are situated above modeled maximum elevations.

12. Boca Reservoir

In 1939, Reclamation completed construction of Boca Dam and Reservoir. Although no formal systematic survey of the reservoir area was conducted before construction, between 1954 and 1962, eight sites were recorded below the maximum elevation; at least two of these have been re-recorded by USFS. Locational information is limited for all sites other than those recorded by USFS. Review of copies of USFS atlas maps indicates that the perimeter of the reservoir above maximum elevation has been surveyed.

Sixteen sites recorded to date include prehistoric basalt tool and flake scatters, lithic scatters, prehistoric flake and ground stone scatters, one historic trash scatter, a prehistoric site, and one of unknown type. One of the flake and ground stone sites has historic structural remains. The Boca facility is listed on the NRHP as part of the Newlands Project.

13. Trophy/Mayberry/Oxbow/Spice

Portions of this segment of the study area, particularly the western third, have been surveyed one or more times in response to urban/municipal development and proposed Federal flood control studies.

The 35 recorded sites include several prehistoric lithic scatters and isolates, ranging from small to large and including, in one case, historic trash; prehistoric sites with milling features or ground stone, two with possible shelters; prehistoric sites with both lithic debris and ground stone/milling features, one possibly a Washoe site, one with a possible historic logging camp, and one with a pile of lumber; one prehistoric campsite with petroglyphs, stone rings, lithics, and bedrock metates; and two Washoe sites, one of which was a stratified winter village. Historic sites not found with prehistoric material include five historic irrigation ditches that parallel the river or have their diversion from it in this stretch; one historic corral and rock feature; a ranch complex; a stone wall; remains of the Verdi Lumber Company; other historic foundations and trash; Jameson's Station; an emigrant trail; and an isolated Chinese bowl rim fragment.

Raven (1992) identified other historic sites whose legal descriptions appear to place them in or near the primary study area in this reach, but these are not formally recorded and, thus, not included in the reach-specific table of the Cultural Resources Appendix. These sites include the locations of Hunter's Bridge and Hotel, Lake's Bridge and Hotel, the Stone and Gates Hotel and Bridge, and diversions for the Eastman, Abbey, American Irrigating, Countryman, Central Pacific Railroad, and English Company historic irrigation ditches.

14. Lockwood

Twenty-three surveys have been conducted, largely in the western third of this segment of the study area, and primarily along the highway on the north side of the river and in a few small to medium-sized block surveys. An estimated 20 percent of the total area has been surveyed.

Prehistoric sites recorded include eight lithic and ground stone scatters, one dense, six with shell, and one with pictographs; eight lithic scatters, one of which is a quarry and one isolate; and one "prehistoric campsite." Historic sites include the Patrick, Derby (not relocated in 1990), and Clark townsites; Tracy Powerplant; two historic debris scatters, one of which may be a railroad construction camp; and Derby Diversion Dam, a NRHP (Newlands Project) listed property and Reclamation's first dam.

15. Nixon

Relatively little of this river reach is reported as having been surveyed; in some cases, portions of block or linear surveys fall near the river. The 12 sites recorded in this reach include one prehistoric lithic scatter; an historic trash dump; two diversion structures; a portion of the Truckee Canal; and the foundations of Adoth townsite. Information on the other sites is lacking.

In 1973, Reclamation asked Dr. Donald R. Tuohy, who completed a survey of the Pyramid Lake Reservation for the Nevada State Museum in cooperation with the Pyramid Tribe in 1965–66, to identify and indicate the value of sites that could potentially be affected by construction of the proposed Marble Bluff Dam and Fishway. Two sites in the primary study area were excavated. Tuohy and Clark (1979) note that one of these was likely to have been under 4 to 12 feet of water in 1862 and 1868 and up to 10 feet in 1890. The other site was probably inundated in 1862, 1871, and 1891.

Resources recorded in this reach, including the excavated sites, are burials found with house pits, prehistoric and protohistoric artifacts, and habitation sites.

16. Pyramid Lake

In 1927, formal cultural resource investigations within the Pyramid Lake Reservation began, with work focused on excavation of a large cave in Marble Bluff. At the Tribe's request, the work was discontinued and no additional work was undertaken on the reservation until 1965, when the Nevada State Museum entered into a contract with the

Tribe to conduct further investigations. Dr. Donald Tuohy directed the work which, in addition to exploring and recording the surface archaeology of the reservation, tested or excavated 102 of the 748 sites located. Additional excavation after 1966 was to be focused on particular classes of sites, including large ones near the mouth of the Truckee River which were badly eroded by the river and heavily collected (Tuohy and Clark, 1979). Small-scale surveys in association with development and improvements have also been conducted on the reservation.

Of the 49 sites recorded at or below elevation 3900 feet and listed (table CRA.2-Pyramid Lake in the Cultural Resources Appendix), 24 have no site record on file. The remaining sites include the following, which seem likely to include all of the possible site types that would occur: three lithic scatters and five lithic isolate locations; two sites with flaked and ground stone; three with pictographs; two with rock alignments, one in conjunction with other materials; four locations with single or multiple caves or rock shelters, with a variety of artifactual material; and five sites with several types of artifacts, including possible habitations. Human remains are reported at three locations, including some at sites with other materials.

The 1960s survey sites have been plotted on 15-minute USGS quadrangles; but in many cases, little information about the sites is available at this time. Locations of all known sites recorded at or below elevation 3860 feet are used in the analysis.

Although the lake's beach area has been intensively used and sites are reported near or just above elevation 3800 feet, most of the recorded sites are above elevation 3840 or 3860 feet. Many are along the drainages that flow into the lake. USGS records for Pyramid Lake are not complete, but in all records between 1867 and 1917 (13 years, 19 readings), the elevation is above 3860 feet. In 1871, the elevation was 3884 feet. Elevations declined from that point through 1960. Between November 1950 and September 1960, with multiple readings each year, the highest elevation was 3810 feet, with most readings below elevation 3805 feet. The lowest reading recorded through 2000 was on February 6 and March 6, 1967, at elevation 3784 feet.

The levels and fluctuations of prehistoric Lake Lahontan (of which the Pyramid Lake area was a part) are beyond the scope of this study, but clearly major fluctuations occurred during the late Holocene, the period of occupation by prehistoric groups described in the Cultural Resources Appendix. Base camps for fishing, and perhaps for other purposes, may well have been located near receding or advancing shorelines, which would have been inundated by subsequent higher lake elevations.

17. Lahontan Reservoir

Twenty-nine cultural resources were identified around the perimeter of Lahontan Reservoir. Reservoir operations for irrigation purposes can cause elevation to fluctuate dramatically, particularly in very dry years, when the difference between high and low elevation has been 58 feet. Most sites around the reservoir are prehistoric in nature. In addition to the Lahontan townsite, assorted historic trash dumps and foundations also exist.

II. Environmental Consequences

Modifying operations of Truckee River reservoirs could affect the water surface elevation of lakes and reservoirs and the quantity, quality, timing, and duration of river/tributary flows, which could affect cultural resources located within or near these water bodies. This analysis evaluates environmental consequences on cultural resources using the following indicator:

- Submergence or exposure of cultural resources within specific site areas, as measured by changes in elevation.

All elevations in this analysis are rounded to the nearest whole number because cultural resource surveys never record site elevations in fractions of a foot. For example, 5840.51 feet mean sea level is rounded to 5841 feet msl, while 5840.50 feet msl is rounded to 5840 feet msl.

A. Summary of Effects

The resources of the Truckee River and its tributaries have been used by humans for centuries, and one drainage has been the focus of human management since the mid-1850s. This continued use has affected previously developed cultural resources sites. Flooding, and to a lesser extent, intervening drought, also affected these resources. The effects of historic flows on cultural resources equal or exceed any that would occur under the proposed alternatives, in which overflow of the banks is rare.

Effects on cultural resource sites on land around the perimeter of lakes or on banks of watercourses above the maximum elevation are virtually the same under the alternatives as under current operations and are not usually discussed as a part of alternative analysis. Such effects include collection of artifacts, or destruction by driving across, digging holes in, or clearing site areas for campsites.

Because of the lack of specific information regarding location or extent of some sites, it is difficult to determine the exact effect on some resources. The tables and discussions provide a reasonable view of the kinds of effects and numbers of known sites involved. For more detail on which sites might be affected, see the facility- and reach-specific tables in the Cultural Resources Appendix.

As noted previously, the amount of survey completed for each reach or feature varies substantially. The need for additional survey and for evaluation of known and newly discovered sites within the primary area would be determined by the lead agency in consultation with the California and the Nevada State Historic Preservation Offices.

Table 3.109 summarizes the effects of the alternatives on cultural resources at lakes and reservoirs in the study area.

Table 3.109—Summary of effects on cultural resources at lakes and reservoirs in the study area

Number [and percentage] of affected cultural resources									
		Current conditions		No Action		LWSA		TROA	
Lake/reservoir	Number of recorded resources in APE	Number of recorded resources affected	% of recorded resources affected	Number of recorded resources affected	% of recorded resources affected	Number of recorded resources affected	% of recorded resources affected	Number of recorded resources affected	% of recorded resources affected
Tahoe	109	34	[31]	34	[31]	34	[31]	34	[31]
Donner	3	2	[67]	2	[67]	2	[67]	2	[67]
Independence	4	3	[75]	3	[75]	3	[75]	3	[75]
Prosser Creek	28	9	[28]	9	[28]	9	[28]	9	[28]
Stampede	26	18	[69]	18	[69]	18	[69]	6	[23]
Boca	16	6	[38]	6	[38]	6	[38]	6	[38]
Pyramid Lake	49	15	[30]	14	[29]	14	[29]	15	[30]
Lahontan	29	13	[45]	13	[45]	13	[45]	13	[45]
Total	264	100	[38]	99	38]	99	[38]	88	[33]

As shown in table 3.109, there is little, if any difference, between the percentages of cultural resources affected under current conditions and the alternatives. One exception is Stampede Reservoir, where, under TROA, one-third fewer cultural resources would be affected than under current conditions and the other two alternatives. Another exception is Pyramid Lake, where one resource could be affected under TROA (and current conditions) but not under the other two alternatives. However, the effect would depend on its precise location and area in relation to projected elevations, and could require further research. Therefore, under TROA, 5 percent fewer cultural resources at lakes and reservoirs would be affected than under current conditions and the other alternatives.

Table 3.110 summarizes the effects of the alternatives on cultural resources along river and stream reaches in the study area.

As shown in table 3.110, there is no difference in the percentage of cultural resources along the river/major tributaries that would be affected under current conditions and the alternatives. The only exception is the Adoth townsite, (noted with an *asterisk in the Derby Diversion Dam to Pyramid Lake reach), which could be affected under TROA and current conditions. The effect would depend on Adoth's exact location and area in relation to maximum flows under TROA, and could require further research.

Although operations model results show that approximately 3 percent more sites would be affected under TROA (and current conditions) than under No Action or LWSA, (especially the three in Nevada reaches), because of the methodological limitations to the collection and interpretation of these data, much of this is speculation based on the best available data.

Table 3.110—Summary of effects on cultural resources along river and stream reaches

Number [and percentage] of affected cultural resources									
		Current		No Action		LWSA		TROA	
Reach	Number of recorded resources in APE	Number of recorded resources affected	% of recorded resources affected	Number of recorded resources affected	% of recorded resources affected	Number of recorded resources affected	% of recorded resources affected	Number of recorded resources affected	% of recorded resources affected
California									
Truckee River Lake Tahoe to Donner Creek	43	5	[12]	5	[12]	5	[12]	5	[12]
Donner Creek: Donner Lake to Truckee River	4	0	[0]	0	[0]	0	[0]	0	[0]
Truckee River: Donner/Boca	26	2	[8]	2	[8]	2	[8]	2	[8]
Independence Creek: Independence Lake to Little Truckee River and Little Truckee River: Independence Creek to Stampede Reservoir	7	2	[28]	2	[28]	2	[28]	2	[28]
Little Truckee River: Stampede Reservoir to Boca Reservoir	11	0	[0]	0	[0]	0	[0]	0	[0]
Prosser Creek: Prosser Creek Reservoir to Truckee River	0	0	[0]	0	[0]	0	[0]	0	[0]
Nevada									
Truckee River: State Line to Lockwood	35	4	[11]	0	[0]	0	[0]	4	[11]
Truckee River: Lockwood to Derby Diversion Dam	23	4	[17]	0	[0]	0	[0]	4	[17]
Truckee River: Derby Diversion Dam to Pyramid Lake	12	1*	[8]	0	[0]	0	[0]	[1]1	[8]
Total	161	18	[11]	9	[6]	9	[6]	18	[11]

* Adoth townsite.

B. Threshold of Significance

For this analysis, an effect on a cultural resource was considered significant if the site would be subjected to fluctuating water elevation, alternately submerging and exposing it.

C. Method of Analysis

This section describes the method of analysis of effects on cultural resources, including the nature of impacts on cultural resources.

1. Nature of Impacts on Cultural Resources

a. Submergence

The proposed action analyzed in this study includes no physical modifications, and, thus, effects on cultural resources are limited to those associated with submergence and exposure. These effects directly relate to elevation (as msl) of lakes and reservoirs in wet, median, and dry hydrologic conditions and stream reaches in wet hydrologic conditions. Flows in wet hydrologic conditions are much more likely to affect those resources than flows in median or dry hydrologic conditions. (Also see "Approach to Analysis.")

Submergence results in scouring and deposition of sediment. (Also see "Sedimentation and Erosion.") It affects cultural resources sites primarily by destroying the context in which they occur by:

- Moving entire sites or individual items from their original location
- Eroding the soil from around the objects, often collapsing items from one time period (strata) into those from another time period, eliminating much of the information the site contained
- Redepositing materials in foreign settings
- Destroying items
- Depositing layers of soil from elsewhere on moved or in-place materials, creating a false context

Permanent submergence in a setting without strong currents may protect or have little or no effect on cultural resources, although examination of these resources is difficult. Alternate exposure and resubmergence is particularly damaging to perishable materials.

Effects of submergence on sites also vary with the type of site. A bedrock mortar or milling stone on a large boulder would not suffer from flooding in the same way that a surface scatter of small flakes or a fire hearth would.

On the other hand, submergence, especially total, can protect cultural resources from the negative impacts of vandalism, looting, and other illegal, scavenger- or collector-oriented activities. (See following discussion.)

b. Exposure and Other Possible Impacts

The lapping action of waves, especially in large, exposed bodies of water subject to wind-fueled current action (e.g., Lake Tahoe or Pyramid Lake), can affect cultural resources. Sites located at water's edge, due to the erosive impact of water continuously moving back and forth, are especially vulnerable under any hydrologic condition.

Exposure of sites in areas of public use abets another type of impact not related to water management: the collection of cultural items by private citizens for personal gain or use. Not only are exposed sites generally subject to greater destruction by natural forces, they are exposed to increasing levels of destruction by human hands, as in use of "mud flats" for dirt bike or all-terrain vehicle usage.

2. Approach to Analysis

To conduct the analysis of effects on cultural resources, two primary pieces of information were necessary: site location and elevation. The first was collected and plotted as described previously, under "Affected Environment." Obtaining the second set of data was more difficult. Data on reservoir storage and flows obtained from the operations model were used to develop the maximum elevation(s) under current conditions and the three alternatives in wet, median, and dry hydrologic conditions for lakes and reservoirs, and wet hydrologic conditions for rivers and major tributaries.

Flows in wet hydrologic conditions only were used to analyze effects on cultural resources along streams because elevation equivalents in median hydrologic conditions cannot be readily converted to reliable elevation numbers (unlike lakes.) Moreover, flows in median hydrologic conditions have no effect on cultural resources located near the top or on the bottom of rivers and tributaries. Additionally, effects, if any, are rare in dry hydrologic conditions, because unless the river or stream channel has been relocated—or if the resources were carried from another location—it is highly unlikely that there are cultural resources located at the bottom of river or stream channels. (See "Surface Water" and the Water Resources Appendix for details of the operations model and the flows used in analysis.)

a. Lakes and Reservoirs

Although differences in elevation in a lake or reservoir *within* a month could affect sites, the lack of daily information did not compromise the analysis. The effects and sites affected would be the same under the clearly defined maximum and minimum elevations within the body of water, although frequent changes in elevation would accelerate effects.

b. Truckee River and Tributaries

To determine the variation within the monthly flow and the difference in elevation, the records of actual daily flows for the month with the highest flow (USGS arithmetic average) during the period of record for a sample of USGS gauges on the Truckee River were reviewed. The results are presented in table 3.111 and appear in the Cultural Resources Appendix as table CRA.1.

Table 3.111—Example of river gauge data (cfs)

Gauge	Month of maximum	Monthly	High daily[1]	Low daily
Truckee	May 1958	2,400 (4.65 feet)[2]	2,920 (5.17 feet)	2,070 (4.32 feet)
Reno	May 1952	5,679 (8.17 feet)	7,630 (9.29 feet)	4,840 (7.7 feet)
Nixon	June 1983	5,398 (8.6 feet)	6,490 (9.2 feet)	3,350 (7.43 feet)

[1] Daily average.
[2] ( ) approximate gauge height of flow.

In these examples, the difference between high daily flow elevation and the maximum monthly flow elevation never differs by more than 1.1 foot, a small amount given the relative accuracy of plotting cultural resources sites.

Effects on cultural resources along streams were analyzed using maximum monthly flows generated from the operations model**.** The maximum monthly flows were then used to develop maximum elevations under current conditions and the alternatives in wet hydrologic conditions**.**

Translating the simulated flow data developed for river reaches into elevation for the Truckee River was not straightforward. The assumptions made and the approach taken follow. USGS gauging stations on the river were matched with points on reaches from the operations model to the extent possible. Elevations for all gauging stations (many recently installed) were plotted to establish the approximate stream elevation at as many points as possible. Approximate slope between stations was determined to decide if it were reasonable to assume an increase in flow of a given number of feet at one point would be approximately the same increase at another point downstream, absent major inflow. Areas of apparently greater slope were addressed separately. Because of the variability in the number of river elevations within reaches, the accuracy of projected elevation is undoubtedly greater in some reaches than others. The least available information is in the Truckee River from Lake Tahoe to Donner Creek, followed by reach from Donner Creek to the Nevada-California State line. In most cases, the height of the simulated maximum flow above zero gauge height at both ends of a reach was very close.

Potential effects on cultural resources at reservoirs and lakes were analyzed as follows:

- Identifying all sites at which elevation(s) are at or below the maximum elevations, with elevation data based on the operations model

- Comparing the elevation of the selected cultural resource sites to the maximum and minimum elevations in wet, median, and dry hydrologic conditions for each lake and reservoir under current conditions and the three alternatives: No Action, LWSA, and TROA

- Noting which sites would be submerged or exposed during the year under each of the three hydrologic conditions, with attention to length of time of exposure and radical change of level, if notable

- Summarizing effects in the three hydrologic conditions under current conditions and the alternatives

Potential effects on cultural resources along the Truckee River, Prosser Creek, and Little Truckee River were analyzed as follows:

- Identifying the maximum seasonal flow in reaches in wet hydrologic conditions generated from the operations model under current conditions and the three alternatives

- Converting the maximum monthly flow data to elevations at the specific gauging stations at both ends of the reach

- Estimating flow elevation at intermediate points within the reach

- Comparing the elevation of sites to estimated flow elevation

- Identifying and noting sites possibly or likely submerged under the maximum elevation, including any relevant information about the sites

See map 3.1 for the reaches of river and tributaries analyzed; to facilitate analysis, some reaches were combined. Also, site and reach-specific tables in the Cultural Resources Appendix are designed to supplement the following analyses.

D. Model Results and Evaluation of Effects

In many cases, submergence and exposure effects resulting from fluctuations in elevations of lakes and reservoirs under LWSA and TROA are the same or similar to those under No Action. Therefore, only differences are described. Additionally, because flows are almost identical under No Action, LWSA, and TROA, the effects under LWSA and TROA in reaches of the Truckee River and its tributaries are the same as under the No Action, in all hydrologic conditions. Again, only differences are described. All elevations indicated are above mean sea level.

Rather than detailing months that effects are most (or least) likely to occur, seasons are used, as shown in table 3.112:

Table 3.112—Seasons as used in cultural resources analysis

Season	Early	Mid	Late
Winter	December	January	February
Spring	March	April	May
Summer	June	July	August
Fall	September	October	November

1. Lake Tahoe

a. Current Conditions

Of the sites listed in the Cultural Resources Appendix, 19 extend to the beach (about elevation 6230 feet) or lie on the beach along or near the water‘s edge. Three are described as going into the water, while two are described as possibly going into the water but are at elevation 6230 feet. One site is described as in the water near the beach (elevation 6225 to 6230 feet). The 1988 survey identified cultural resources along the lake‘s edge below the 6229 foot level; site numbers were not assigned to these, nor have the exact extent or elevations been determined or recorded. Because no cultural material has been recorded on the exposed land above elevation 6230 feet that correlates with these locations, the extent of remaining material within the pool is unknown.

Operations model results show that in wet hydrologic conditions under current conditions, those sites between elevation 6228 and 6230 feet are exposed most of the year. Portions of two sites above elevation 6228 feet are subject to wave action (“Erosion and Other Possible Effects”) all year.

In median hydrologic conditions, elevation averages 6228 feet. Sites above elevation 6227 feet are exposed or in the fluctuation zone, and thus subject to exposure part of the year. Those sites above elevation 6228 feet are exposed all year. Two sites are subject to wave action all year in wet hydrologic conditions.

In dry hydrologic conditions, sites between elevation 6222 and 6229 feet are exposed and submerged respectively. Sites above elevation 6223 feet are exposed or partially exposed in early summer, while sites between elevation 6222 and 6223 feet are exposed or partially exposed fall through spring. Two sites are exposed all year.

b. No Action, LWSA, and TROA

Operations model results show a minimum elevation of 6223 feet in dry hydrologic conditions. When sites are reported as being in shallow water, it is not clear where below elevation 6223 feet they lie. Because all of the sites along the beach lie above elevation 6229 feet (the maximum lake elevation), none would be directly affected under any alternative.

Operations model results show that in wet hydrologic conditions, sites between elevation 6228 and 6229 feet would be exposed in early summer. A portion of two sites would be subject to wave lapping action the entire year.

In median hydrologic conditions, sites above elevation 6227 feet would be exposed or in the fluctuation zone during early winter, and sites between elevation 6227 and 6228 feet would be exposed or in the fluctuation zone the rest of the year. Again, portions of two sites would be subject to wave action all year.

In dry hydrologic conditions, sites above elevation 6222 feet would be exposed or partially exposed in early winter, while those above elevation 6222 feet would be exposed or partially exposed in fall and winter. Two sites would be exposed all year. Portions of these sites could be subject to wave lapping action, depending on water levels.

Because the differences between the maximum and minimum elevations are virtually the same in wet, median, and dry hydrologic conditions—less than one foot—exposure and submergence of all sites is expected to be the same under all alternatives.

2. Truckee River: Lake Tahoe to Donner Creek

a. Current Conditions

Operations model results show that five known sites may be submerged or partially submerged by maximum flows in this reach. Lower flows probably do not affect these sites.

b. No Action, LWSA, and TROA

The maximum flow at the USGS gauge immediately downstream from Lake Tahoe, the upper end of the reach, is 114 cfs. Therefore, the maximum monthly late winter flow of 1,494 cfs in wet hydrologic conditions under all alternatives cannot be directly converted to water surface elevation.

Flow from tributaries in this reach undoubtedly would increase the flow elevation at the Truckee gauge, but no data exist in the operations model for these inflows or for the Truckee gauge. Truckee gauge flows were estimated by subtracting Donner Lake releases from Truckee River flow. The maximum monthly flow at the Truckee gauge is 2,075 cfs in early spring, which is 4.3 feet above zero, or elevation 5862 feet. The water

surface elevation along the river was estimated to be at approximately the same level above zero. Five known sites within the primary study area could be submerged only by the highest flows under any of the alternatives.

Sites at the confluence of the Truckee River and its smaller tributaries, such as Squaw Valley, could be affected by combined flows of the river and the tributary, but this is not a result of releases into the Truckee River channel under any alternative.

3. Donner Lake

a. Current Conditions

One site could be affected by fluctuations in lake elevation. A large lithic scatter in Donner Memorial State Park that extends downslope to the maximum projected elevation of 5936 feet is subject to fluctuating elevation in wet and median, hydrologic conditions.

Another site recorded at 5860 feet remains completely submerged under current conditions. It is not known as to whether this site extends up from this elevation.

b. No Action

Operations model results show that fluctuating elevations would affect one site in all hydrologic conditions. In wet and median hydrologic conditions, operations model results show that the elevation fluctuates from below the lower portion of the site up to the portion at the maximum elevation, which would expose the entire site in winter to spring and largely cover it the remainder of the time, subjecting the portion near maximum elevation to potential wave damage. In dry hydrologic conditions, the maximum elevation is below the lowest extent of the site, resulting in exposure all year.

c. LWSA and TROA

As at Lake Tahoe, because operations model results show that the difference between the maximum and minimum elevation for Donner Lake is the same in wet, median, and dry hydrologic conditions—less than a half-foot variant—expected site exposure and submergence are approximately the same under LWSA and TROA as under No Action.

4. Donner Creek: Donner Lake to Truckee River

Operations model results show a maximum flow in this reach of 141 cfs (or elevation 5828 feet) in wet hydrologic conditions under current conditions and the three alternatives. Elevations for three of the four sites recorded along the reach downstream from Donner Memorial State Park are given as 5960 feet. Two of these sites have been excavated and thus require no further consideration. The remaining two sites are above the maximum monthly elevation and would not be affected.

5. Truckee River: Donner Creek to State Line

Operations model results show that in wet hydrologic conditions under current conditions and the alternatives, the maximum monthly flow for the Truckee River from Donner Creek to the Little Truckee River confluence is 2079 cfs (elevation 5862 feet) in late spring. Downstream from the confluence, the maximum monthly flow is 2231 cfs (elevation 5862.1 feet) in early summer.

Three cultural resources are at locations that could be inundated by the maximum monthly flow. It is possible that these sites have been or are being affected by this high flow. Other sites plotted near the river appear to be above the maximum monthly flow elevation. This flow would not affect the Boca Brewery site or the Boca townsite under any of the alternatives.

6. Prosser Creek Reservoir

a. Current Conditions

Nine sites appear to lie partially or completely below the maximum elevation of 5741 feet shown by operations model results. Thus, in wet hydrologic conditions, four sites are submerged all year; three sites are submerged spring through summer and exposed the remainder of the year; and two sites are submerged or in the fluctuation zone in late spring. From late spring through summer, the portions of these sites between elevation 5740 and 5741 feet are submerged or in the fluctuation zone, while other sites are exposed. The lower edge of one site is submerged or in the fluctuation zone from late spring through late summer and exposed the remainder of the year.

In median hydrologic conditions in late spring, three sites are possibly submerged or in the fluctuation zone; these sites are exposed the remainder of the year. The lower portions of two sites are likely in the fluctuation zone in late spring but are exposed the remainder of the year. One site is exposed all year, while four others are submerged all year.

In dry hydrologic conditions, all identified sites are exposed all year.

b. No Action and LWSA

Nine recorded sites appear to lie below the maximum elevation of 5741 feet shown by operations model results. Two sites are partially below the maximum elevation. Five are among the sites located by Elsasser and Shumacher in their 1957 survey of the project area.

At elevation 5741 feet, most sites would be submerged all or part of the time during the summer. In median hydrologic conditions, three sites would be exposed all year, except late spring, when areas up to elevation 5713 feet would be submerged or in the fluctuation zone.

The lower portion of two other sites would be covered in late spring; these sites would be exposed the remainder of the year. One site would be exposed all year, and four sites would be submerged all year.

In dry hydrologic conditions, (elevation 5671 feet), all nine sites would be exposed in late winter. The 69.9 foot difference in elevation between wet and dry hydrologic conditions is the same under current conditions. However, given the length of time the sites have been subjected to substantial annual fluctuations in the elevations, the sites may no longer have retained integrity.

c. TROA

Operations model results show that, under TROA in wet hydrologic conditions, three sites would be submerged all year. Five other sites would be exposed during six months in the winter. Three of these five would be submerged or affected by wave action from late spring to early fall. In early summer, the lower edge of one site would be subject to wave action or submerged. This site would be exposed the remainder of the year.

In median hydrologic conditions, no sites would be submerged all of the time, and only one would be partially submerged. From late spring to mid-summer, operations model results show that the elevation is at or near three sites. As a result, these sites are likely to be subject to wave action and possibly submerged in late spring and exposed the remainder of the year. The extreme lower portions of some sites could also be affected in the same way. One other site would be exposed all year.

In dry hydrologic conditions, all sites above 5695 feet would be exposed in late winter.

Although recorded cultural resources would be affected in different ways under the various alternatives, depending on hydrologic condition, Prosser Creek Reservoir operations under TROA would result in no difference in the number and percent of resources affected, when compared to No Action or current conditions (table 3.109).

7. Prosser Creek: Prosser Creek Reservoir to Truckee River

Because no firm site locations are recorded for this area, effects under current conditions and the alternatives cannot be analyzed.

8. Independence Lake

Because only one known historic site is possibly located adjacent to the maximum elevation of the lake, discussion of effects under current conditions is limited**.** The identified site is reported by the site repository to be several miles from Independence Lake—and well above projected maximum elevations—thus, no impacts are expected. The other three sites are well below the lake's minimum elevation in dry hydrologic conditions, as shown by operations model results, so they would remain submerged under current conditions and all alternatives.

9. Independence Creek: Independence Lake to Little Truckee River *and* Little Truckee River: Independence Creek to Stampede Reservoir

Efforts to determine the elevation of the maximum monthly flow in Independence Creek (105 cfs in wet hydrologic conditions in early summer under current conditions and the alternatives) were not useful. With only one gauging station located 0.4 mile downstream from the dam and a considerable drop in elevation along the reach, no estimate of elevation of the flows at the location of the four cultural resource sites can reasonably be made. The two Hobart historic sites (water wheel and logging camp) were undoubtedly placed to take advantage of the creek flows, and some features would reasonably be at the edge of or in the water. The purposes and exact relation of the prehistoric sites to Independence Creek are unknown.

On the Little Truckee River between Independence Creek and Stampede Reservoir, because no elevation for the one historic site (a berm, CA-SIE-1322) was given, effects under current conditions and the alternatives cannot be analyzed.

10. Stampede Reservoir

a. Current Conditions

Of the 17 sites known to be near or below the maximum elevation, two were recorded by CDPR archeologist and historians in 1991, (Nesbitt, et al., 1991); five by USFS; two others in 1958 and 1966; and the remainder in 1957. One other site, recorded in 1967, may lie below the maximum elevation. The sites recorded in 1957 and 1958–1966 were plotted on USGS 30-minute quadrangles replotted on 7 1/2-minute quadrangles. For this analysis, these were plotted by legal description to the quarter/quarter section. Two sites were partially excavated in 1967 and, thus, may require no further attention. Most of the sites are described as flake or flake and tool scatters, mostly basalt. Three of these have other material as well. No elevations are given for six sites.

Operations model results show a maximum elevation of 5949 feet in mid-summer. Therefore, in wet hydrologic conditions under current conditions, 13 sites are submerged all year; a portion of one site between elevation 5942 and 5880 feet is submerged all year, while the portion of the site between elevation 5942 and 5948 feet is in the fluctuation zone from spring to late summer. The portion of another site between elevation 5945 and 5948 feet is in the fluctuation zone from spring through late summer and exposed the remainder of the year. Three sites appear to be subject to wave action when the elevation is 5948 feet.

In median hydrologic conditions (maximum elevation 5933 feet), 11 sites are submerged all year. For two sites, a portion is submerged all year, a portion is in the fluctuation zone, and a portion is exposed all year. Another site probably is subject to wave action from early fall to mid-winter and is submerged the rest of the year.

In dry hydrologic conditions (maximum elevation 5824 feet), 11 sites are exposed all year, and no sites are submerged all year. Portions of three sites between elevation 5832 and 5800 feet are exposed in late winter and early spring, in rising and receding water the remainder of the year, and the portions located between elevation 5832 to 5840 feet are exposed or in a area subject to wave action all year. Another site is exposed in late winter and early spring and is in rising and receding water the remainder of the year.

b. No Action and LWSA

Operations model results show a maximum elevation of 5948 feet in mid-summer in wet hydrologic conditions. At that elevation, most sites would be submerged the entire year. A portion of another would be entirely submerged all year; the remainder of the site would be in the fluctuation zone from spring through summer. Portions of one other site would be in the fluctuation zone from spring through summer and exposed the remainder of the year.

In median hydrologic conditions (maximum elevation 5933 feet), one site would be submerged the entire year. A portion of one site would be submerged, a portion would be in the fluctuation zone, and a portion would be exposed all year. A portion of another site would be submerged the entire year. One site would be exposed, except for late spring, while three others would be exposed all year.

In dry hydrologic conditions (maximum elevation 5834 feet), 10 sites would be exposed and one site would be submerged all year. Portions of three sites would be exposed all year, while other portions would be subject to elevation changes 11 months of the year. Portions of two sites would be exposed the entire year, and other portions would be exposed all year, except late spring. One site would be exposed all months except in late spring, and would be subject to wave action in early summer.

c. TROA

Operations model results show a maximum elevation of 5949 feet in wet hydrologic conditions under TROA. Therefore, 13 sites would be submerged all year. For another site, one portion would be submerged all year, and another portion would be in the fluctuation zone from spring through summer. A portion of another site would be in the fluctuation zone from spring through summer and exposed the remainder of the year. Two other sites are likely to be subject to wave action when the elevation is 5948 feet.

In median hydrologic conditions (maximum elevation 5941 feet), 11 sites would be submerged all year. A portion of another site would be submerged all year, while other portions would be in the fluctuation zone. One portion of yet another site would be submerged all year, and another portion would be in the fluctuation zone from mid-winter to mid-summer. A portion of one site would be exposed from fall to early winter. Three other sites would be exposed all year.

In dry hydrologic conditions (maximum elevation 5884 feet), 19 sites and almost all of two others would be submerged all year. The upper portions of these two sites would be

in the fluctuation zone. Three other sites would be exposed or in the fluctuation zone in late winter to early spring and submerged the remainder of the year. Portions of two other sites would be submerged or in the fluctuation zone all year, with a portion of one exposed all year. Four sites would be exposed all year.

It is clear that Stampede Reservoir's recorded cultural resources would benefit under TROA, compared to No Action and current conditions. Although recorded cultural resources would be affected in different ways under the various alternatives, depending on hydrologic condition, under TROA, only one-third of recorded cultural resources would be affected, when compared to the other alternatives (table 3.109).

11. Little Truckee River: Stampede Reservoir to Boca Reservoir

Operations model results show a maximum monthly flow of 973 cfs (estimated elevation of 5620 feet) in wet hydrologic conditions under TROA for this reach of the Little Truckee for the gauge located one mile upstream of Boca Reservoir and projected upstream and downstream. All cultural resources recorded in this reach are above this projected elevation. Therefore, no sites on this reach would be affected under current conditions or the three alternatives.

12. Boca Reservoir

a. Current Conditions

No professional survey to identify cultural resources was conducted within the reservoir pool before construction of Boca Dam. Thus, the effects on only five sites identified near or within the maximum elevation located in conjunction with specific USFS actions or general surveys after construction of the dam are discussed. The effects on other sites which almost certainly exist below the maximum elevation cannot be specifically addressed, although they would be similar to the effects on similar sites at other reservoirs.

Operations model results show a maximum elevation of 5605 feet in wet hydrologic conditions under current conditions. At this elevation, five sites are exposed from fall through early spring. For the remaining period (spring through summer), portions of these sites are submerged. One site is submerged all year.

In median hydrologic conditions (maximum elevation 5575 feet) five sites are exposed for 8 months and submerged or partially submerged from mid-spring to mid-summer, when the portions below elevation 5605 feet are submerged. The other site likely is submerged all year.

In dry hydrologic conditions (maximum elevation 5521 feet), five sites are exposed all year, and the other is completely or partially submerged.

b. No Action and LWSA

Operations model results show a maximum elevation of 5605 feet in wet hydrologic conditions. At this elevation, most sites would remain exposed from late spring to early summer. During the remaining period, portions of sites would be submerged or subjected to wave action. One site would be submerged year-round.

In median hydrologic conditions (maximum elevation 5573 feet), five sites would be exposed for 8 months and submerged or partially submerged from mid-spring to mid-summer, when the portions below elevation 5605 feet would submerged. The other site would be submerged all year. In dry hydrologic conditions (maximum elevation 5523 feet), all Boca Reservoir sites, except one, would be exposed in mid-winter.

c. TROA

Operations model results show a maximum elevation of 5605 feet in wet hydrologic conditions under TROA. At this elevation, five sites would be exposed for 6 months. In the other 6 months, portions of all five sites would be submerged or in the fluctuation zone. Another site also would be submerged. In median hydrologic conditions (maximum elevation 5588 feet), two sites would be exposed for 8 months and covered or partially covered from spring to mid-summer, when portions below elevation 5605 feet would be submerged. Another site would be submerged all year. In dry hydrologic conditions (maximum elevation 5531 feet), five sites would be exposed all year, and another would be submerged.

Although recorded cultural resources would be affected in different ways under the various alternatives, depending on hydrologic condition, Boca Reservoir operations under TROA would result in no difference in the number and percent of resources affected, when compared to No Action or current conditions (table 3.109).

13. Trophy/Mayberry/Oxbow/Spice

a. Current Conditions and TROA

Discussion of resources in this reach of the river is divided into segments based on USGS gauge locations. The elevation for the maximum flow for the upper end of the segment of the reach between the State line and Reno (3,563 cfs in wet hydrologic conditions in mid-spring) is 5160 feet under current conditions. The estimated river elevation at Verdi, where sites begin for the reach, is 4830 to 4840 feet. For the segment of the reach beginning at Reno, the elevation for the maximum flow (3,513 cfs in wet hydrologic conditions in mid-spring) is 4439 feet. At the Vista gauge near Lockwood, the elevation for the maximum flow (3,679 cfs in wet hydrologic conditions in mid-spring) is 4407 feet.

There is a possibility, but no recorded evidence, that four cultural resource sites may be affected by these flows, which are less or functionally equal to maximum flows under the alternatives. These sites include two between Verdi and the Mogul gauging station, and two between the Mogul gauge and the Reno gauge, just above the surface of the water.

b. No Action and LWSA

There are no projected effects to cultural resources under No Action and LWSA in this reach.

14. Lockwood

a. Current Conditions and TROA

Portions of two sites lie along the river between the Vista gauge and just downstream from the Tracy gauge. The lower portion of one site is reported to have been destroyed largely through gravel operations. The remaining portion is above projected maximum flow elevation. The other site has also been greatly damaged. Based on the flow elevation at Tracy, approximately 2.5 miles downstream, these sites could be affected under current conditions and TROA.

Between the Tracy gauge and Derby Diversion Dam, portions of two sites may lie within the flow elevations shown by operations model results for current conditions and TROA. The first is an isolate out of context, and the other is reported to be disturbed. Because of these factors, these sites are likely to be only mildly affected, if at all, under current conditions and TROA.

b. No Action and LWSA

Because operations model results show flows under No Action and LWSA are less than under current conditions and TROA, no effects are likely.

15. Nixon

a. Current Conditions and TROA

Of the 12 listed sites, six stand unrecorded, so it is impossible to know precisely what these sites are and where they are located. Only the Adoth townsite appears to lie just below the estimated high flow elevation of 4185 feet and could be partially inundated under TROA; however, there is no evidence of flooding reported with the site information.

b. No Action and LWSA

Because operations model results show flows under No Action and LWSA are less than under current conditions and TROA, no effects are likely.

16. Pyramid Lake

a. Current Conditions

As discussed under “Affected Environment,” a large number of sites were recorded on the Pyramid Lake Reservation in the mid-1960s by Dr. Donald Tuohy, with others added

through compliance work over the years. The 1960s survey sites have been plotted on 15-minute quadrangles, but, in many cases, little information about the sites is available.

Fifteen sites or portions of sites are known to lie within the maximum elevation under current conditions. Two of these sites were human internments that have been disinterred, and one was an isolated basket that has been collected and is not considered further here. Basic information is available for four of the remaining sites: two are lithic scatters; one is a multifeatured site whose features extend upslope from 3800 to 3890 feet; and the other is a fishing camp and possible burial site which extends below elevation 3800 feet into the lake. No site record is currently available for this last site, and status of investigations of the features is unknown.

Operations model results show a maximum elevation of 3852 feet in wet hydrologic conditions under current conditions. At this elevation, 11 of the sites or site locations are submerged the entire year. Portions of two large sites are affected differently. For one site, the portion below elevation 3846 feet is submerged all year, while the portion between elevation 3846 and 3848 feet is in the fluctuation zone, and the portion above elevation 3848 feet is exposed all year. For the other site, the portion below 3846 feet is submerged all year; the portion between 3846 and 3848 feet is in the fluctuation zone; and the portion above elevation 3848 feet is exposed all year. One other site is exposed the entire year.

In median hydrologic conditions (maximum elevation 3837 feet), nine sites are submerged, and three sites are exposed all year. One site is submerged in late spring and early summer and exposed the remainder of the year. A portion of another site between elevation 3800 and 3828 feet is submerged all year; the portion between elevation 3828 and 3830 feet is in the fluctuation zone; and the portion above elevation 3830 feet is exposed all year.

In dry hydrologic conditions (maximum elevation 3822 feet), ten sites are exposed and three are submerged all year. For one site, the portion between elevation 3800 and 3806 feet is submerged all year; the portion between elevation 3806 and 3810 feet is in the fluctuation zone; and the portion above elevation 3810 feet is exposed all year.

b. No Action and LWSA

Operations model results show a maximum elevation of 3850 feet in wet hydrologic conditions. At this elevation, 15 sites or portions of sites would be submerged. As discussed under current conditions, two of these sites were human internments that have been disinterred and one was an isolated basket that has been collected and is not considered further here. Basic information is available for five of the remaining sites: two are lithic scatters; one, a multi-feature site whose features extend upslope from elevation 3800 to 3890 feet; one, a U-shaped rock wall; and one, a fishing camp and possible burial site that extends below elevation 3800 feet into the lake. No site record is currently available for this last site, and status of investigations of the features is unknown.

In median hydrologic conditions (maximum elevation 3835 feet), ten sites would be submerged all year, while three others would be exposed all year. At another site, portions would be submerged all year, portions would be in the fluctuation zone, and portions would be exposed all year.

In dry hydrologic conditions (maximum elevation 3820 feet) three sites would be submerged all year. Portions of another site would be subject to fluctuating elevations. All remaining sites would be exposed all year.

c. TROA

In wet hydrologic conditions (maximum elevation 3853 feet) all of the sites that would be submerged under No Action also would be submerged under TROA. Portions of two others would be submerged, exposed, or in the fluctuation zone.

In median hydrologic conditions (maximum elevation 3839 feet) the same sites that would be submerged under No Action would be submerged under TROA, but fluctuation and exposure of the sites would begin at elevation 3839 feet.

In dry hydrologic conditions (maximum elevation 3822 feet) the same sites submerged under No Action would submerged under TROA. Portions of one site still would be subject to fluctuation or exposure but at different elevations than under No Action.

17. Lahontan Reservoir

a. Current Conditions

Although Lahontan Reservoir receives irrigation water from the Truckee River via the Truckee Canal, it is not a part of the primary study area. It is, however, part of the secondary study area. Twenty-nine cultural resources adjacent to the lake's perimeter (or close to) were identified in recent follow up research.

Operations model results show that under current conditions and the three alternatives**,** the reservoir's 4163-foot maximum elevation from mid-spring to early summer in wet hydrologic conditions inundates many of the prehistoric sites, most of which were excavated in the mid-1970s. At this elevation, ten sites are inundated, with two or three more partially covered. Although most of these sites were excavated, there is a chance that some materials may remain. It is possible that other sites remain undiscovered.

In median and dry hydrologic conditions (when Lahontan Reservoir's elevation is at 4147 and 4113 feet, respectively), it is possible that more prehistoric and historic sites may be uncovered. Many of the reservoir's known sites are well above the 4163-foot elevation, however, and would, therefore, be unaffected.

b. No Action, LWSA, and TROA

Operations model results show that in wet hydrologic conditions under all alternatives, the reservoir's maximum monthly elevation from mid-spring to early summer is 4163 feet—the same as under current conditions. Therefore, effects on cultural resources would be the same as under current conditions.

In median hydrologic conditions (maximum elevation 4146 feet) elevation vary less than one-half foot among the three alternatives. Effects on cultural resources would be the same as under current conditions.

In dry hydrologic conditions, (maximum elevation 4106 feet, or 57 feet lower than in wet hydrologic conditions), all sites, except one, would be exposed. Two sites have no elevation records, and it is possible that more sites could be uncovered.

Finally, operations model results show that the elevation of Lahontan Reservoir fluctuates less than two-thirds of a foot in wet or dry hydrologic conditions. Thus, the hundreds of recorded cultural resource sites located downstream from Lahontan Dam in the Carson River valley would not be affected. Because of this, these resources are not considered further here.

III. Mitigation

No mitigation is expected. Mitigation under any alternative would occur only if cultural resources are present that are eligible for the NRHP and they are being adversely affected by lake/reservoir operations or land uses or are being damaged by natural agents.

Reclamation's policy is to seek to avoid impacts to cultural resources whenever possible. If an action is planned that could adversely affect an archeological, historical, or traditional cultural property site, then Reclamation will investigate options to avoid the site. However, if avoidance is not possible, protective or mitigative measures will be developed and considered.

Cultural resources management actions will be planned and implemented consistent with consultation requirements defined in 36 Code of Federal Regulations 800, using methods consistent with the Secretary of the Interior's Standards and Guidelines.''

If mitigation is necessary, the lead agency, working in coordination with other involved agencies, tribal authorities, California and Nevada State Historic Preservation Offices, and the Advisory Council on Historic Preservation, will develop a programmatic agreement that will detail any requirements needed to mitigate and resolve adverse effects to cultural resources that may result from implementation of TROA or any alternatives.

INDIAN TRUST RESOURCES

I. Affected Environment

Indian trust resources are legal interests in property or natural resources held in trust by the United States for Indian Tribes or individuals. The Secretary is the trustee for the United States on behalf of Indian Tribes. All Interior bureaus share the Secretary's duty to act responsibly to protect and maintain Indian trust resources reserved by or granted to Indian Tribes or Indian individuals by treaties, statutes, and Executive orders. These rights are sometimes further interpreted through court decisions and regulations. Examples of trust resources are lands, minerals, hunting and fishing rights, and water rights. Interior carries out its activities in a manner that protects trust resources and avoids adverse impacts when possible. When adverse impacts cannot be avoided, appropriate mitigation or compensation is to be provided in consultation with the affected Tribes and/or individuals.

Indian trust resources were assessed in consultation with the following tribes in the study area: Pyramid Lake Paiute Tribe—Pyramid Lake Indian Reservation (which includes Pyramid Lake) in Nevada; Reno-Sparks Indian Colony—Reno and Hungry Valley, in Nevada; Fallon Paiute-Shoshone Tribes—Fallon Paiute-Shoshone Reservation and Fallon Colony in Nevada; and Washoe Tribe of Nevada and California.

Trust resources of these Tribes include land, water rights, and fish and wildlife; incomes are derived from these resources. The Tribes are concerned with regional water quality and quantity, water distribution, fish and wildlife, and wetlands.

A. Pyramid Lake Indian Reservation

The formal recognition of the trust relationship between the Pyramid Tribe and the United States can be based on the 1859 withdrawal for Indian use of "a tract of land in the northern portion of the valley of the Truckee River, including Pyramid Lake." After subsequent surveys, an Executive order was issued in March 1875 that further acknowledged the reservation of the Pyramid Lake Paiutes. The reservation presently covers 475,085 acres.

P.L. 101-618 affirmed that "all existing property rights or interests, all of the trust land within the exterior boundaries of the Pyramid Lake Indian Reservation shall be permanently held by the United States for the sole use and benefit of the Pyramid Tribe (Section 210[b][1])." This legislation also recognizes Anaho Island as a part of the reservation and affirms tribal ownership of the Pyramid Lake lakebed and the beds and banks of the lower Truckee River.

B. Reno-Sparks Indian Colony

The Reno-Sparks Indian Colony was created in 1916, when 20 acres were set aside in Reno for use by members of the Northern Paiute, Washoe, and Western Shoshone people. An additional 8 acres were added later. Recently, the colony acquired 1,920 acres in Hungry Valley north of Reno. The land is used primarily for residential purposes.

C. Fallon Indian Reservation and Colony

The Fallon Paiute-Shoshone Indian Reservation is located in Churchill County in west-central Nevada, approximately 10 mile northeast of Fallon and 65 miles east of Reno and Carson City. The reservation was created following the General Allotment Act of 1887, when members of the Paiute and Shoshone Tribes were allotted about 31,360 acres in the Lahontan Valley. The lands were located in an area that would become part of the Carson Division of the Newlands Project. In 1906, an agreement was made in which Tribal members would exchange their original 160-acre allotments of nonirrigable lands for 10-acre allotments of irrigable lands with paid up water rights. A 1907 order by Interior reserved 4,640 acres on behalf of Tribal members who had relinquished their original allotments. An additional 840 acres adjoining the north boundary of the reservation were set aside in 1917. Water was first delivered to the allotted lands between 1908 and 1910. Currently, 5,513 of the 8,156 acres of the reservation are water righted. Approximately 1,800-3,175 acres have been irrigated. The Fallon Indian Colony was established with 40 acres, with an additional 20 acres added in 1958; Colony land is used for residential and commercial purposes.

D. Washoe Tribe of Nevada and California

The Washoe Tribe of Nevada and California is a federally recognized Indian tribe organized pursuant to the Indian Reorganization Act of June 18, 1934, as amended. The Tribal office is located in Gardnerville, Nevada. The Washoe Tribe has four communities, three in Nevada (Stewart, Carson, and Dresslerville), and one in California (Woodfords). There is also a Washoe community located within the Reno-Sparks Indian Colony. The Washoe Tribe has jurisdiction over trust allotments in both Nevada and California, with additional Tribal Trust parcels located in Alpine, Placer, Sierra, Douglas, Carson, and Washoe Counties; it has cultural interests at and near Lake Tahoe but does not exercise any water rights in the Lake Tahoe or Truckee River basins. Tribal history extends an estimated 9,000 years in the Lake Tahoe basin and adjacent east and west slopes and valleys of the Sierra Nevada. The present day Washoe Tribe has deep roots in the past, radiating from Lake Tahoe, a spiritual and cultural center, and encompassing an area that stretches from Honey Lake to Mono Lake.

E. Water Rights

1. Pyramid Tribe

The Federal actions that set aside Pyramid Lake Indian Reservation explicitly reserved Pyramid Lake for the Tribe's benefit. Water rights for the reservation were claimed by Interior in 1913, at the same time Interior was claiming water for the Newlands Project. When the *Orr Ditch* decree was finally issued in 1944, the Pyramid Tribe was given an appropriation date of 1859, senior to all other appropriators. Under the *Orr Ditch* decree, the Pyramid Tribe was allocated for irrigation an amount not to exceed 4.71 acre-feet per acre for 3,130 acres of bottomland farm (14,742 acre-feet) (Claim No. 1) and another 5.59 acre-feet per acre for 2,745 acres of benchlands (15,345 acre-feet) (Claim No. 2). Other than irrigation, no additional water was allocated for the fish or fish habitat in Pyramid Lake or the lower Truckee River.

Over the years, the Tribe has actively worked to protect Pyramid Lake and increase inflow to the lake. With the elevation of Pyramid Lake falling and flows diminishing, the Tribe, in 1973, sought to reopen the *Orr Ditch* decree to obtain additional water rights for the lake and its fishery. The Tribe alleged that the Federal Government had breached its trust responsibility when it defended water rights for the Newlands Project and did not diligently defend Tribal water rights for all purposes. Following lengthy litigation, the U.S. Supreme Court ruled in 1983 that the *Orr Ditch* decree was final and binding.

When Interior implemented operating criteria for the Newlands Project in 1967, the Tribe intervened, claiming that the Secretary was taking his trust responsibilities too lightly. The Secretary was advised that his trust responsibilities included conserving water for the Tribe. Interim implementation of the Newlands Project's Operating Criteria and Procedures decreased diversions from the Truckee River; thus allowing additional water to flow into Pyramid Lake. Additionally, Stampede Reservoir and, to a lesser degree, Prosser Creek Reservoir, are operated to supplement unregulated Truckee River flows for the benefit of Pyramid Lake fishes.

2. Fallon Paiute-Shoshone Tribes

The Fallon Tribes entered into a settlement agreement that was ratified by Congress as Title I of P.L. 101-618, or the Fallon Paiute-Shoshone Indian Tribes Water Rights Settlement Act of 1990. Section 103 of P.L. 101-618 limits annual water use on the reservation to 10,587.5 acre-feet (equivalent to 3,025 acres). It also, however, permits the Tribes to acquire up to 2,415.3 acres of land and up to 8,453.55 acre-feet of water rights. These water rights may be used for irrigation, fish and wildlife, M&I, recreation, or water quality purposes, or for any other beneficial use subject to applicable laws of the State of Nevada.

An expanded irrigation system was envisioned by P.L. 95-337 and enacted by the Congress in 1978; however, the construction of this system was not pursued and was superseded by a financial settlement as part of P.L. 101-618. BIA entered into an agreement with FWS in 1995 to acquire water rights for reservation wetlands; under that agreement, 1,613.4 acre-feet of water rights have been acquired. Water rights on and appurtenant to the reservation are served by Newlands Project facilities pursuant to OCAP.

3. Reno-Sparks Indian Colony

Members of the Reno-Sparks Indian Colony believe they may have rights to about 30 acre-feet of water under the *Orr Ditch* decree.

F. Fish and Wildlife

1. Pyramid Tribe

The Pyramid Lake fishery remains one of the cultural mainstays of the Pyramid Tribe. To protect the fishery, the Tribe maintains two hatcheries; is working cooperatively with Federal, State, and private agencies to protect spawning areas and improve river access for spawning, as noted below; and seeks more inflow to Pyramid Lake, as noted previously. The Tribal fishery program operates hatcheries at Sutcliffe and Numana. Tribal hatcheries raise both the threatened LCT and endangered cui-ui. LCT hatcheries support a world-class fishery; the cui-ui hatchery is a "fail-safe" operation to maintain the strain in case of catastrophic event.

The Tribe uses a portion of the interest from the principle of the $25-million Pyramid Lake Paiute Fisheries Fund, provided under section 208 of P.L. 101-618, for management of the Pyramid Lake fishery. As part of endangered and threatened species recovery efforts, the Federal Government, in consultation and coordination with the Pyramid Tribe, is developing a plan for rehabilitating lower Truckee River riparian habitat to enhance fish passage and spawning. Improvements have occurred to Marble Bluff Dam facilities. Along with conserving fish, the Pyramid Tribe manages and controls fishing and hunting rights on the reservation.

2. Fallon Paiute-Shoshone Tribes

The Tribe has dedicated reservation acreage to be used for wetland habitat for wildlife.

G. Trust Income

P.L. 101-618 established the $43-million Fallon Paiute-Shoshone Tribal Settlement Fund, the $25-million Pyramid Lake Paiute Fisheries Fund, and the $40-million Pyramid Lake Paiute Economic Development Fund. Interest on the Fallon Paiute-Shoshone Tribal Settlement Fund may be spent according to the Fallon Tribes' investment and

management plan for this fund. The Pyramid Tribe has complete discretion to invest and manage the Pyramid Lake Paiute Economic Development Fund; however, funds are not available to the Tribe until TROA becomes effective.

II. Environmental Consequences

Modifying operations of Truckee River reservoirs could affect Indian trust resources. This section evaluates potential effects on the Indian trust resources of water rights and fish and wildlife. No land resources of any tribe would be directly affected under any of the action alternatives.

A. Pyramid Tribe

Lower Truckee River flows and discharge to Pyramid Lake would be greater under TROA. With greater flow and the capacity to manage such water, TROA would: assist in improving lower river water quality; enhance the elevation of Pyramid Lake; enhance the riparian canopy in and stabilize the lower river; enhance recreational opportunities at Pyramid Lake; enhance spawning opportunities for cui-ui; and enhance river habitat for Pyramid Lake fishes. In addition, the exercise of Lower Truckee River agricultural and M&I water rights, including those of the Pyramid Tribe, would continue to be satisfied under all alternatives. Therefore, TROA would generally have beneficial effects on these trust resources. (Trust resources of the Pyramid Tribe are addressed in greater detail in “Surface Water,” “Water Quality,” “Sedimentation and Erosion,” “Biological Resources,” “Recreation,” “Economic Environment,” “Social Environment,” and “Cultural Resources” in this chapter)

B. Reno-Sparks Indian Colony

Implementation of any of the action alternatives would have no effect on the exercise of Truckee River water rights. To the extent that the Colony has such water rights, TROA would have no effect on this trust resource.

C. Fallon Paiute-Shoshone Tribes

The Carson Division water supply is minimally affected by any of the action alternatives. The water rights on Fallon Indian Reservation are fully served to a 56 percent supply year, which condition is not exceeded according to operations model results. Therefore, the exercise of water rights of the Tribes and individual Indians on Fallon Indian Reservation are satisfied under all alternatives, and TROA would have no effect on this trust resource. (Lahontan Reservoir storage and releases are addressed in greater detail in “Surface Water” in this chapter.)

D. Washoe Tribe

TROA would not affect flows of the Carson River and would have no effect on land and water resources in the Lake Tahoe basin. Therefore, TROA would have no effect on these trust resources. (Lake Tahoe resources are addressed in greater detail in "Water Quality" and "Sedimentation and Erosion" in this chapter.)

E. Mitigation

No mitigation would be required because no significant adverse effects would occur under any of the alternatives.

AESTHETIC RESOURCES

This section describes aesthetic resources, i.e., the visual character and visual resources of the study area. Modifying reservoir operations in the Truckee River basin could affect lake and reservoir water elevations and the quantity, timing, and duration of flows, which could, in turn, affect the visual character of the area.

Aesthetics has been defined as the study or theory of beauty and the psychological responses to it (SWRCB, 2003). For this study, information was adapted from the U.S. Forest Service Visual Management System inventory and analysis conducted for Tahoe and Humboldt/Toiyabe National Forest portions of the study area and from the BLM Visual Resource Management System applicable to portions of the study area east of Reno.

This section generally describes the visual character and visual resources of the study area, with focus on State and nationally designated scenic highways, shoreline views, and on-river views.

I. Affected Environment

A. Lake Tahoe, Truckee River to the Nevada State Line, Including Donner Lake, Prosser Creek Reservoir, Independence Lake, and Stampede and Boca Reservoirs

This portion of the study area lies on the eastern slope of the Sierra Nevada Landscape Province. It is characterized by summits of high altitude peaks that descend across gently sloping dark blue-green forests of moderately rugged terrain dissected by deeply incised river canyons. Most of the drainages generally run towards the Truckee River with minor lateral drainages. Because of the rugged terrain, viewing other drainages is difficult.

For the purpose of evaluating aesthetic resources, three landscape zones can generally be characterized within this portion of the study area. These are the high elevation zone, montane-sub-alpine zone, and lower elevation "front country" (Reuter, et al., 2000). The high alpine zone ranges in elevation from about 7,000 to 11,000 feet. This zone provides mostly background views seen at long distances from areas affected by Truckee River operations and offers outstanding scenic quality. The high elevation zone is characterized by gray and tan peaks with dense pockets of dark green mixed conifers and lighter green aspen stands. There are also meadows, streams, waterfalls, and glacial lakes.

The montane-sub-alpine zone lies below the high elevation zone and is characterized by moderately steep to steep terrain with a homogenous texture of dark-green forest

interspersed with rock outcroppings. Elevations for this zone are 3000 to 7000 feet. Large open meadows are visible. Lake Tahoe, Donner Lake, and Prosser Creek, Stampede, and Boca Reservoirs lie within this zone. Landscape variety is generally low to medium but the screening ability (related to the dense forest canopy) is generally high.

The lower elevation "front country" zone ranges in elevation from about 1000 to 3000 feet. This zone is dominated by brush fields interspersed with oaks, bull or gray pine and ponderosa pine. Forested areas are light colored, open and sparse. Landscape variety is generally low with a low screening ability because of the open nature of the country and relatively light, smaller bushes and shrubs.

B. Truckee River from Reno to Pyramid Lake, Lahontan Reservoir, Portions of Carson River

This portion of the study area is characterized by viewsheds consisting of low-lying high desert landscape intermixed with numerous mountain ranges and hills. These contrasting viewsheds provide an exceptional display of open space and mountain scenery that enhance the aesthetic quality of the area. The mountainous portions are comprised of highly differential rock formations, large expanses of light grey granite, and a diversity of high desert adapted vegetation. Views of the mountain ranges are highly valued.

Lower elevations include numerous alluvial fans and cones, which form at the mouth of canyons draining the mountains and higher hills. These expansive deposition areas form an important and visually interesting transition between the foothills and higher elevations, and the valley floors. The alluvial fans are comprised of washes and braided streams that support plant habitats adding to the diverse visual character.

The valley floors are comprised of a mix of soil, sand, and rocks. In many areas, riparian corridors consisting of intermittent or permanently flowing streams host a diversity of tall trees, willows, and a profusion of grasses and shrubs. These areas provide a visual contrast to the surrounding monotone grays, tans, and browns. Riparian corridors are visually interesting and stimulating to the scenic viewer. In the spring, the valley floors are frequently covered with wildflowers, providing vivid colors and visual interest.

C. Historic Trends

The visual quality of most of the study area has been altered as a result of landscape modifications associated with timber harvest, road construction, community developments, utility rights-of-way, dams, and other multiple use management activities. Some modifications such as the construction of reservoirs have actually enhanced the visual quality by introducing water features into the characteristic landscape.

Most of the pre-1900 visual disturbances within the study area have disappeared with the exception of scattered railroad grades, mines, and mine tailing piles. One of the most significant visual affects from these early years was the evolution of cross-country trails

and wagon routes into the present-day transportation system. From 1920 to 1940, timber harvesting, construction of roads and railroads, and fire suppression activities significantly influenced the visual landscape of the area. Additionally, hydroelectric development resulted in reservoirs, dams, powerhouses, roads, transmission lines, and recreation facilities. More recently developed recreational facilities have altered the landscape. Major fires, especially in the higher elevations, have also resulted in drastic changes to the visual landscape with long-term effects on visual quality (SWRCB, 2003).

D. USFS Visual Management System

In the 1970s, USFS developed the Visual Management System (VMS) to manage the scenic resources on America's National Forests. USFS considers the visual environment as a basic resource of national forest lands to receive equal consideration with other basic multiple use resources such as oil, wildlife, timber, and water. VMS is a methodology for: (1) inventorying the visual resource; (2) establishing management objectives for the visual resource; (3) assessing visual impacts associated with proposed actions. Those portions of the study area within Tahoe National Forest and Humboldt/Toiyabe National Forests have been inventoried and management direction in the form of Visual Quality Objectives (VQO) has been developed in their Forest Long Range Management Plans. Following is a description of the five possible VQO designations within the study area.

E. BLM Visual Management System

- BLM has the responsibility to maintain the scenic values of the public lands under its jurisdiction. To this end, BLM developed a Visual Resource Management System (VRM) as a tool to manage its visual resources.

VRM provides a way to identify and evaluate scenic values to determine the appropriate levels of management and to analyze potential visual impacts and apply visual design techniques to ensure that surface-disturbing activities are in harmony with their surroundings. VRM consists of two stages, inventory and analysis.

The inventory stage involves identifying the visual resources of an area and assigning them to inventory classes. The process involves rating the visual appeal of a tract of land, measuring public concern for scenic quality, and determining whether the tract of land is visible from travel routes or observation points. The process is described in *BLM Handbook H-8410-1, Visual Resource Inventory*. The results of the visual resource inventory become an important component of BLM's Resource Management Plan (RMP) for the area. An RMP establishes how the public lands will be used and allocated for different purposes. Visual values are considered throughout RMP, and the area's visual resources are then assigned to management classes with established objectives:

Class I Objective: To preserve the existing character of the landscape; the level of change to the characteristic landscape should be very low and must not attract attention

Class II Objective: To retain the existing character of the landscape; the level of change to the characteristic landscape should be low

Class III Objective: To partially retain the existing character of the landscape; the level of change to the characteristic landscape should be moderate.

Class IV Objective: To provide for management activities which require major modification of the existing character of the landscape; the level of change to the characteristic landscape can be high.

The analysis stage involves determining whether the potential visual impacts from proposed surface-disturbing activities or developments will meet the management objectives established for the area, or whether design adjustments will be required. A visual contrast rating process is used, which involves comparing project features with major features in the existing landscape using the basic design elements of form, line, color, and texture. This process is described in *BLM Handbook H-8431-1, Visual Resource Contrast Rating*. The analysis can then be used as a guide for resolving visual impacts. BLM managers can decide whether to accept or deny project proposals or attach mitigation stipulations to the proposal.

Most of the BLM administered lands within the study area (generally east of Reno) have not been inventoried and rated; those that have been, especially adjacent to I-80, from Reno to Fernley, are Class III Objective. Plans call for BLM to inventory and rate all public lands within Churchhill County.

F. California Environmental Quality Act

CEQA Guidelines provides the following four criteria to evaluate the significance of visual quality impacts:

- Negative impacts on a scenic vista
- Damage to scenic resources within a state scenic highway
- Degradation of the visual character or quality of a site and its surroundings
- Creation of a new source of substantial light or glare affecting views

G. Scenic Corridors

California Department of Transportation—California Scenic Highways Program: The California Scenic Highways Program was created by the State legislature in 1963 to preserve and protect scenic highway corridors from change that would reduce the aesthetic value of lands adjacent to highways. There is no designated California Scenic Highway within the study area.

Nevada Department of Transportation—Nevada Scenic Byway Program: Nevada Scenic Byway Program was established in 1994 to promote and protect the State's most remarkable roads for travelers. To be designated, the stretch of land covered by the roadway must be rich in visual beauty as well as cultural and historical significance. The following roadways within the study area are Nevada Scenic Byways:

- **Pyramid Lake Scenic Byway:** This is the only byway in the nation sponsored by Native Americans. Pyramid Lake is surrounded by a relatively barren desert. Its color changes from green to turquoise to deep blue. Its most striking feature is a pyramidal rock that rises 400 feet above the lake surface. The byway is 37 miles long and incorporates State Routes 445, 446, and 447.

- **Lake Tahoe—East Shore Drive Scenic Byway:** Surrounded by national forest lands and state parks, Lake Tahoe possesses spectacular scenery. East Shore Drive provides spacious views of Lake Tahoe basin. The pristine lake is surrounded by the snowcapped Sierra Nevada. The byway is 72 miles long. State Route 28 portion of the Scenic Byway passes through portions of the study area.

Federal Highway Administration—National Scenic Byways Program: This program was established to designate "All American Road" (a roadway that is a destination unto itself) or "National Scenic Byway" (a roadway that possesses outstanding qualities that exemplify regional characteristics). Pyramid Lake Scenic Byway and Lake Tahoe and East Shore Drive Scenic Byway discussed above are both designated National Scenic Byways.

U.S. Forest Service—National Scenic Byways Program: Roadways of scenic importance that pass through national forests are eligible for inclusion in this program. There is no USFS designated National Scenic Byway within or near the study area.

Bureau of Land Management—Back Country Byways: Back County Byways are usually travel routes in more remote areas that are designated as special areas because of their outstanding scenic qualities. There is no designated Back Country Byway within or near the study area.

Scenic Roads or Corridors Designated through County Planning: While counties within the study area have designations for outstanding scenic resources within their county comprehensive or general planning processes, it is determined that potential impacts from implementation of any of the alternatives under consideration would have no impact on any county scenic corridors.

II. Environmental Consequences

The following indicators were used to evaluate the effects of the alternatives on aesthetic resources:

- State and nationally designated scenic highways
- Shoreline views
- On-river views

As explained in Section II.C, "Reservoir Storage and Releases," in "Surface Water," operations model results show that total end-of-month reservoir storage under TROA is greater than under No Action, LWSA, and current conditions—primarily in Prosser Creek, Stampede, and Boca Reservoirs—as the result of storage of Credit Waters. Operations model results show that, under TROA, Lake Tahoe storage in wet and dry hydrologic conditions is slightly less and in median conditions slightly more than under No Action or current conditions because of Credit Water operations. Such small differences in storage would have a similarly small effect on lake elevation. As explained in Section II.E, "Pyramid Lake," in "Surface Water," operations model results show that elevation of Pyramid Lake under TROA is higher than under No Action or current conditions because of greater inflow. As explained in Section II.D, "Flows," in "Surface Water," operations model results show that average monthly flow in wet, median, and dry hydrologic conditions under current conditions, No Action, LWSA, and TROA varies seasonally at each location.

A. State and Nationally Designated Scenic Highways

The Pyramid Lake Scenic Byway and Lake Tahoe East Shore Drive Scenic Byway are the only two designated scenic highways within the study area. As generally explained above, effects on the aesthetic resources from implementation of TROA would be beneficial; effects under any alternative or current conditions would be similar and minimal.

B. Shoreline Views

Over the long term, modeling shows that the elevation of Pyramid Lake will generally increase. However, seasonal fluctuation in lake level resulting from fluctuating inflow would result in a temporary visual "ring" of lighter colored rock and soil along the shoreline. This ring would occur to some degree under all alternatives, including No Action. Generally the months with the lowest flows (potential effects on the visual resource) are in the winter, which coincide with the lowest numbers of visitors driving the Pyramid Lake Scenic Byway.

Likewise, seasonal fluctuation of lake and reservoir levels in the study area resulting from fluctuating flows would result in temporary visual "rings" of lighter colored rock and soil

along their shorelines. These rings would occur to some degree under all alternatives, including No Action. Again, the months with the lowest flows (potential effects on the visual resource) are in the fall and winter (with a couple of exceptions occurring in late summer) which coincide with the lowest numbers of visitors.

C. On-River Views

The effects to the river aesthetic resources from implementation of the alternatives are much different than for lakes and reservoirs, and are generally more subjective. As river flow fluctuates, visual changes occur. Lower flows generally result in the exposure of more boulders, river banks, and gravels. Some people prefer the slower, meandering, lazy flows; others prefer the cascading, rushing, pounding flows experienced during periods of high water. The following statement summarizes the effects of implementing the alternatives on on-river views:

There is little difference among the alternatives. Each alternative encompasses period of higher and lower flows, potentially affecting the appearance of the river. For some visitors, this will have a negative consequence. For others, it will serve to enhance the visual characteristics of the area.

NEWLANDS PROJECT OPERATIONS

The water supply for the Newlands Project is obtained from the Carson and Truckee Rivers. The Carson River is the primary water source for the Carson Division of the Newlands Project. Use of Carson River water is governed by the *Alpine* decree. Some of the water in the Carson River is diverted upstream of Lahontan Reservoir by urban and agricultural users in California and Nevada. Truckee River water is diverted into the Truckee Canal at Derby Diversion Dam for irrigation in the Truckee Division and for delivery to Lahontan Reservoir. Water stored in Lahontan Reservoir is released primarily to satisfy the exercise of water rights in the Carson Division. During dry periods, diversions from the Truckee River comprise a greater proportion of the water supply for the Carson Division than during average periods.

Newlands Project OCAP has been promulgated to meet project irrigation requirements consistent with the *Orr Ditch* and *Alpine* decrees while minimizing use of Truckee River water and maximizing use of Carson River water. Those decrees specify maximum annual water duties in the Newlands Project of 3.5 and 4.5 acre-feet per acre on bottom and bench lands, respectively. OCAP allows for local control of project operations to the maximum extent possible while fulfilling the Secretary's responsibilities under the *Orr Ditch* and *Alpine* decrees and Federal reclamation law and addressing the Secretary's trust responsibilities to the Pyramid Tribe and Fallon Paiute-Shoshone Tribes and obligations under ESA.

Truckee River water is diverted as necessary to satisfy the exercise of Truckee Division water rights consistent with OCAP. For the Carson Division, forecasting techniques—which include information on Truckee River and Carson River runoff, Carson Division demand, and reservoir evaporation and seepage losses -- are used to estimate the quantity of Truckee River water necessary to be diverted to meet monthly Lahontan Reservoir storage targets. Variable end-of-month January through June Lahontan Reservoir storage targets are identified in OCAP, with the objective of achieving a specified storage at the end of June (e.g., 186,000 acre-feet based on an annual Carson Division demand of approximately 268,700 acre-feet). From July through December, Truckee River water may be diverted to Lahontan Reservoir only when reservoir storage is, or is forecast to be, less than the monthly target. Monthly storage targets (in acre-feet) for July through December (based on the annual 268,700-acre-foot demand) are: July -156,000; August - 96,000; September - 60,000; October - 48,000; November - 70,000; and December - 97,000. Generally, diversion of Truckee River water to the Truckee Division will vary directly with demand; diversion of Truckee River water to Lahontan Reservoir for use on the Carson Division will vary directly with demand but depend in large part on Carson River inflow to Lahontan Reservoir (e.g., if the storage target is met or exceeded with Carson River water, diversion of Truckee River water to Lahontan Reservoir is terminated).

I. Potential Effects of the Alternatives

Future changes in the disposition and exercise of Truckee Division and Carson Division water rights are assumed to occur independently of TROA. Diversion of Truckee River water to satisfy a portion of the future Newlands Project water demand (described earlier in this chapter in "Surface Water") will continue to be regulated by OCAP. The potential effects of TROA on the Newlands Project, therefore, can be measured most objectively by comparing the quantity of Truckee River water available for diversion at Derby Diversion Dam and resulting Truckee Canal inflow to Lahontan Reservoir, Lahontan Reservoir storage, and Lahontan Reservoir releases to the lower Carson River under the various alternatives. A summary of operations model results for the identified parameters is presented in table 3.113; this information was previously presented in "Surface Water."

Table 3.113—Parameters related to Newlands Project operations (average annual, in acre-feet)

	No Action	LWSA	TROA
Diversion to Truckee Canal	51,810	51,670	51,780
Truckee Canal inflow to Lahontan Reservoir	43,840	43,720	43,750
Lahontan Reservoir storage (end of June)	225,280	225,150	224,820
Lahontan Reservoir releases (to Carson Division)	303,400	303,290	303,360

Operations model results show little difference between TROA and the other alternatives. Slightly less water is provided under TROA because the holders of upstream senior Truckee River water rights would be able to maintain more of their water in storage. Effects on Newlands Project water use would not be discernible on a long-term basis, as average annual releases from Lahontan Reservoir are similar under TROA and No Action (a difference of 40 acre-feet, or approximately 0.0001 per cent of the total); agriculture and wetlands uses would not be affected; Indian trust resources on Fallon Indian Reservation would not be affected. Newlands Project groundwater resources in the study area would be affected primarily to the extent of and in proportion to differences in the amount of Truckee River water diverted to the Truckee Canal to flow to Lahontan Reservoir, as shown in table 3.113. Differences in canal flow would affect slightly the amount of seepage to the shallow aquifer adjacent to the canal and also Lahontan Reservoir releases to the Carson Division. The minor reductions in Truckee Canal discharge and Lahontan Reservoir releases for irrigation on the Carson Division would likely have no measurable effect on groundwater resources on the Newlands Project.

The lower Carson River does not cause sedimentation or erosion problems in most years because water from the river is usually routed through the 381 miles of canals and laterals of the Carson Division. A function of irrigation demand, Lahontan Reservoir releases are nearly identical under all alternatives, and TROA would have little effect on the dynamics of sedimentation or erosion at Lahontan Dam or in the lower Carson River or Carson Division.

The operations model was used to determine the amount of available surface acres at Lahontan Reservoir for water-based recreation during the 7-month recreation season in wet, median, and dry hydrologic conditions (table 3.114), and inferences were made about how recreationists might respond to changes in surface acreage. As Lahontan Reservoir elevation (and, thus, surface acreage) decreases, mud flats develop, boat access is restricted, and the quality of the fishing experience declines, thus attracting fewer recreationists. For the three representative hydrologic conditions, Lahontan Reservoir elevation and, thus, quality of the recreation experience are similar for the three alternatives, and so TROA would have no measurable effect on recreation compared to No Action.

Table 3.114—Average surface acreage of Lahontan Reservoir during recreation season

Hydrologic condition	No Action	LWSA	TROA
Wet	12,520	12,529	12,520
Median	6,604	6,600	6,588
Dry	3,673	3,659	3,651

On the basis of the analysis of recreation at Lahontan Reservoir and releases to serve Newlands Project water rights, there would be little or no economic impact from TROA compared to No Action. For biological resources, TROA, compared to No Action, would have little or no effect on fish in Lahontan Reservoir relative to minimum pool maintenance or spawning habitat. TROA would have no effect relative to predator access to bird-nesting islands or on the prey base of bald eagles. As noted previously, operations model results show that the elevation (or storage) of and releases from Lahontan Reservoir are similar under all of the alternatives. Thus, the recorded cultural resource sites located downstream from Lahontan Dam would not be affected by TROA. These results indicate that, compared to No Action, TROA would have no measurable effects on Newlands Project operations, summer recreation at Lahontan Reservoir, or on local groundwater recharge linked to the availability of Truckee Canal discharge or Lahontan Reservoir releases.

For TCID's Lahontan Dam hydroelectric powerplants, both generation and gross revenues under TROA are similar to those under No Action in all hydrologic conditions and about 3 percent less than under current conditions in all hydrologic conditions. Such differences in gross revenue would not significantly impact the regional economy. As noted in Section G.2, "Carson Division Shortages and Lahontan Dam Hydroelectric Power Generation," in "Economic Environment," comparison of the hydroelectric power generation for the shortage years indicates gross revenues would be 9 to 15 percent less under the alternatives than under current conditions. The effect on the regional economy would not be significant because other sources in the regional power grid could provide additional required power. Analysis shows that hydroelectric power generation and gross

revenues under TROA would be slightly less under than under No Action (less than 1 percent), which should not significantly affect the profitability of TCID's hydroelectric power operations or the regional economy.

As noted in "Surface Water," Section F, "Exercise of Water Rights to Meet Demand," Newlands Project supplies from the Truckee River in the future are less than under current conditions because Carson Division demand is less and water rights in the Truckee River basin are more fully exercised. As noted in Section G.1, "Carson Division Shortages and Agricultural Production," in "Economic Environment," effects would be the same under all the alternatives compared to current conditions. Compared to No Action, shortages are 0.1 percent less under TROA and would not have a significant effect on the regional economy.

II. Credit Water Operations

A similar section summarizing analysis of selected Newlands Project Credit Water (NPCW) operations for No Action, LWSA, and TROA was also included in the revised DEIS/EIR. The range of potential effects in that analysis was limited by a narrow modeling interpretation of Newlands credit water operations. Neither No Action nor LWSA included such credit water operations provided for in OCAP, and establishment of NPCW was predicated on Sample California Guidelines objectives. (It is recognized here that those guidelines are not mandatory, and only offer targets for stream habitat benefits.) Operations model results for the TROA alternative in the analysis of this document are based on a scenario in which establishment of NPCW was predicated on the ability to forecast the release of NPCW during July without exceeding sample California Guidelines (non-mandatory) maximum discharge objectives of 600 cfs from Lake Tahoe, 150 cfs from Prosser Creek Reservoir, 250 cfs from Stampede Reservoir, and a maximum flow objective of 600 cfs in the Truckee River downstream from the Little Truckee River. In that scenario, NPCW was stored in Truckee River reservoirs and not released before July 1. Model results show a release of NPCW in 21 of the 100 years, with a maximum storage of 1,300 acre-feet. In addition to the environmental effects described in the preceding section, the TROA alternative incorporating this NPCW operation also contributed to increased seasonal flow and enhanced water quality in the Truckee River as well as enhanced habitat conditions in the lower Truckee River.

This final EIS/EIR also includes analysis of a broader range of potential Newlands Project credit operations by adding scenarios for (1) No Action with Newlands credit storage under OCAP (NAC) and (2) expanded Newlands credit storage under TROA up to 50,000 acre-feet (TROA-EC). (See Section 3.H.1, "Expanded Newlands Project Credit Water Storage.") OCAP contains provisions for credit water operation that allow for the retention in Stampede Reservoir of potential diversions to the Lahontan Reservoir prior to the end of June (in order to avoid exceeding the end-of-June storage target for Lahontan Reservoir) for release as necessary thereafter through the remainder of the irrigation season. Reclamation policy implementing those provisions was issued in

June 2006; these provisions are described in chapter 2. Additionally, in the expanded Newlands credit water operations section, No Action and TROA are modeled with the California Guidelines storage restriction as voluntary rather than mandatory.

As presented in figure 3.30 in "Surface Water," operations model results show that Carson Division shortages occur in the same 9 years and are of similar magnitude under TROA, No Action, and NAC. Under TROA-EC, one additional shortage year (of 8,000 acre-feet) occurs, and, in the other 9 shortage years, shortages are the same in 1 year and greater in 8 years (differences ranging from 1,000 to 18,000 acre-feet) compared to TROA. Shortages could be greater under expanded credit storage operations because end-of-June Lahontan Reservoir storage targets would be less likely to be exceeded; therefore, the amount of carryover water (i.e., water in excess of monthly storage targets after June) is likely to be less. For this reason, shortages would not occur in years when credit storage is implemented, and the effects of shortage are exacerbated only to the extent that carryover potential is diminished.

Newlands credit operations provisions in OCAP and TROA recognize the variability in precipitation and runoff events and the inherent imprecision in forecasting by:

- Allowing a high runoff event or series of events in the Carson River to fill Lahontan Reservoir sufficiently to achieve (or even exceed) the end-of-June storage target and reduce the likelihood of making unnecessary diversions from the Truckee River that would exceed the storage target or spill

- Allowing NPCW to be released to satisfy the exercise of Carson Division water rights should Carson River inflow to Lahontan Reservoir be insufficient to achieve the end-of-June storage objective that year

- Converting NPCW not required to be diverted to Lahontan Reservoir that year pursuant to OCAP to water for Pyramid Lake fishes and other uses

Additional opportunities for establishing Newlands credit water are provided under TROA compared to OCAP. The potential benefits of Newlands credit operations include the following:

- Greater seasonal storage in Truckee River reservoirs

- Additional Fish Credit Water that could be available for Pyramid Lake fishes

- Greater Truckee River flows during the summer, which would enhance water quality as well as riverine and riparian habitat

- Increased inflow to Pyramid Lake

Implementation of Newlands credit water operations in a given year is discretionary. While such implementation would likely result in less storage in Lahontan Reservoir in

that year compared to operations without Newlands credit water, Lahontan Reservoir storage targets would be achieved, at a minimum, consistent with OCAP to the extent that there is sufficient runoff available in that year.

Coordinating release of Newlands credit water with other releases could benefit Newlands Project operations by reducing fluctuation of diversions at Derby Diversion Dam and maintaining a more constant monthly flow in the Truckee Canal. Such coordination could also reduce fluctuation of lower Truckee River flow which would also benefit biological resources in the lower river. Under any Newlands credit scenario, maximizing the use of the Carson River and minimizing use of the Truckee River would be consistent with OCAP.

MINIMUM BYPASS FLOW REQUIREMENTS FOR TMWA'S HYDROELECTRIC DIVERSION DAMS ON THE TRUCKEE RIVER

This section presents a comparison of the effects of bypass flow requirements at TMWA's four run-of-the-river diversion dams on fish flow requirements in the respective bypass reaches of the Truckee River between Little Truckee River and Hunter Creek (reaches 8, 9, and 10 shown on map 3.1) under current conditions and alternatives.[8]

I. Current Conditions, No Action, and LWSA Minimum Bypass Flows

TMWA has *Orr Ditch* decree rights to divert sufficient water[9] from the Truckee River to provide various flow from 327 cfs to 400 cfs to its four hydroelectric powerplants (Farad, Fleish, Verdi, and Washoe) located along the Truckee River between Little Truckee River and Hunter Creek (map 3.2). At each facility, diverted water is conveyed via a flume to a hydroelectric powerplant, where it either passes through turbines or overflows into spillways before discharging back to the river. Under No Action and LWSA, as well as current conditions, TMWA would maintain a minimum bypass flow of 50 cfs at Fleish, Verdi, and Washoe Diversion Dams for the benefit of fish resources in the river immediately downstream. As a condition of reconstructing Farad Diversion Dam, the California State Water Resources Control Board would require TMWA to maintain a bypass flow of 150 cfs or the total flow of the Truckee River, whichever is less, for the benefit of fish resources in the bypass reach. (See Section II, "No Action" and Section III, "LWSA," in chapter 2.) The combined length of the four bypass reaches (8.4 miles) represents about 35 percent of the river reach between Little Truckee River and Hunter Creek, and 7 percent of the entire length of the river.

II. TROA Bypass Flows

The minimum bypass flow under TROA would be 50 cfs at all four diversion dams (section 9.E.1 of the Negotiated Agreement). TROA would, however, provide more operational flexibility in achieving greater bypass flows (section 9.E.2 of the Negotiated Agreement) than under current conditions, No Action, and LWSA by allowing Fish Water, released for the benefit of LCT and cui-ui in the lower Truckee River and Pyramid Lake, to enhance bypass flows for the benefit of fish resources immediately downstream

[8] It is assumed in this analysis that the Farad Diversion Dam is rebuilt.

[9] TMWA may divert up to 450 cfs at each diversion dam. This includes project water released from Stampede and Prosser Creek Reservoirs for the benefit of LCT and cui-ui.

from the diversion dams[10] (with the United States monetarily compensating TMWA for any net loss in hydroelectric power generation associated with the bypass of Fish Water). Fish Water could also be released specifically to enhance bypass flows above the minimum at the diversion dams if such release benefited LCT or cui-ui.

When Floriston Rates are not being met at the Farad gauge,[11] up to 50 cfs of Fish Water during October–April and up to 150 cfs of Fish Water during May–September could be used to enhance bypass flows above the minimum.[12] The rate at which Fish Water may be released for this purpose depends on the rate at which Fish Credit Water, Other Credit Water owned by the United States, and Newlands Project Credit Water are being captured in storage at the time. (See Section IV, "TROA," in chapter 2.) TROA would not limit the amount of Fish Water that could be used to enhance bypass flows when streamflow, excluding Fish Water, is equal to or greater than Floriston Rates at the Farad gauge.

In addition to Fish Water, section 7.A.6(c) of the Negotiated Agreement would allow California to release California Environmental Credit Water and Additional California Environmental Credit Water to enhance bypass flows at the four diversion dams without restriction. California would compensate TMWA for any loss in hydroelectric generation associated with the bypass of these credit waters.

III. Fish Flow Requirements

Based on the relation of the amount of fish habitat to streamflow, CDFG recommends a minimum flow for fish in the Truckee River between Little Truckee River and Hunter Creek of 150 cfs and an optimum flow of 250 cfs (table 3.38).[13]

IV. Method of Analysis

The potential to achieve minimum bypass flows, minimum fish flows, and optimum fish flows and to enhance bypass flows under current conditions and the alternatives is evaluated by comparing average monthly and average annual bypass flows generated by the operations model. To simplify the presentation, LWSA is not included because the hydrologic assumptions for it are nearly identical to No Action.

[10] This action is permitted by sections 5.B.6(a)(5), 5.B.8(c), and 9.E.2 of the Negotiated Agreement.

[11] Fish Water released for bypass enhancement, and Fish Water and Fish Credit Water released to compensate for diversion for ice removal from the Highland Ditch are not considered to be part of Floriston Rate water.

[12] Fish Credit Water may not be used for bypass flow enhancement when this condition exists.

[13] CDFG recommended a range of minimum (100 to 200 cfs) and optimum flows (200 to 300 cfs) that vary with season and location – average values are used here to simplify the analysis. While these flows provide the minimum and optimum amounts of habitat for supporting a salmonid population, they are not the minimum for survival.

Table 3.115 presents the bypass flow requirements for the four hydroelectric diversion dams and the water categories used to achieve them under current conditions and the alternatives. While TROA allows water managers (i.e., United States and Pyramid Tribe) flexibility in using Fish Water to enhance bypass flows at the diversion dams, the management strategy that they will employ is not known at this time. Because of the range of potential management strategies under TROA, use of the range's extremes (TROA 50 and TROA 200) is considered sufficient for comparing potential effects of TROA to those of current conditions and No Action.

Table 3.115—Bypass flow requirements and water management strategies under current conditions, No Action, and TROA (TROA 50 and TROA 200) at the four diversion dams

	Minimum bypass (cfs)	Enhanced bypass (cfs)	Total bypass (cfs)	Water categories used for bypass flows
Farad Diversion Dam				
Current conditions	150	0	150	All categories used for minimum
No Action	150	0	150	All categories used for minimum
TROA 50	50	0	50	All categories used for minimum – Fish Water is only released for six-flow regime and may not be used to enhance bypass flows
TROA 200	50	50 Oct-Apr 150 May-Sep	100 200	All categories used for minimum – Fish Water is released to enhance bypass flow
Fleish, Verdi, and Washoe Diversion Dams				
Current conditions	50	0	50	All categories used for minimum
No Action	50	0	50	All categories used for minimum
TROA 50	50	0	50	All categories used for minimum – Fish Water is only released for six-flow regime and may not be used to enhance bypass flows
TROA 200	50	50 Oct-Apr 150 May-Sep	100 200	All categories used for minimum – Fish Water is released to enhance bypass flow

At one extreme is the TROA 50 management scenario, in which Fish Water is not released for bypass flows, but only to achieve the six-flow regime targets in the lower Truckee River—the same manner as Fish Water is managed in the operations model for chapter 3 analyses. (See "Truckee River Operations for Pyramid Lake Fishes" in "Surface Water.") Therefore, the amount of Fish Water present at the diversion dams is incidental to bypass flow targets, and may not be used to enhance bypass flows.

At the other extreme is the TROA 200 management scenario, in which Fish Water is released specifically to enhance bypass flows. Depending on the time of year, up to an

additional 50 cfs or 150 cfs could be bypassed at each diversion dam. Fish Water that is bypassed continues to flow to the lower Truckee River where it is used to achieve the six-flow regime targets.

Under TROA 50 and TROA 200, the rate at which Fish Water is released to enhance bypass flows is reduced by the rate at which Fish Credit Water and Newlands Project Credit Water are simultaneously captured in storage.[14]

TROA 200 was not modeled because time did not allow for the extensive reprogramming required of the operations model; therefore, only a qualitative discussion that is based on the availability of Fish Water under TROA (an annual average of about 60,000 acre-feet) is presented. Also, use of California Environmental Credit Water and Additional California Environmental Credit Water is not evaluated because California has not proposed a program to acquire water rights to establish these credit waters.

The diversion dam for Steamboat Ditch (which serves agricultural rights in Truckee Meadows) is located about midway in the 2.4-mile river bypass reach downstream from Fleish Diversion Dam. Since the water right for Fleish hydroelectric powerplant is junior to water rights associated with Steamboat Ditch, there is generally enough water in the river to serve the ditch. Table 3.116 presents the average monthly diversions used in the operations model associated with current conditions and alternatives. Differences in values among current conditions and alternatives reflect anticipated conversion of Truckee Meadows agricultural water rights to M&I use in the future. Since more agricultural water rights would be converted to M&I use under TROA than No Action, less water would be diverted to Steamboat Ditch under TROA.

Table 3.116—Average monthly diversions (cfs) for Steamboat Ditch used in the operations model

	Current conditions	No Action	TROA
April	0.0	9.2	1.8
May	12.4	21.5	4.2
June	57.0	23.3	4.6
July	58.4	25.6	5.1
Aug	57.9	19.7	4.2
Sept.	55.5	17.5	3.4
Oct	13.8	2.9	0.6

[14] Capturing Other Credit Water could also reduce the amount of Fish Water simultaneously bypassed. This water category was not included in the computer simulations because no water rights have been identified to establish it. Adjusted streamflow means total flow less (1) Fish Water released to enhance bypass flows and (2) Fish Water and Fish Credit Water released to compensate for diversions at the Washoe/Highland Ditch diversion facility. (See sections 5.A.8(a) and 9.E.2 of the Negotiated Agreement.)

V. Model Results

Average monthly data simulated by the operations model for current conditions and the alternatives reflect the general runoff pattern of the Truckee River; flows progressively increase through winter, with the greatest flows occurring during spring runoff; flows then progressively decrease through summer and early fall (table 3.117). Though these data indicate that minimum bypass flows under current conditions and the alternatives are achieved on average at each diversion dam, the minimum bypass flow requirement is most critical during late summer when bypass flows rapidly decrease from July through September, a general trend that progressively intensifies downstream. This summer trend reflects diminishing streamflows and a relatively constant demand to divert river water. However, average bypass flows during October do not follow this trend, and are markedly greater than flows during August, September, and November because of reservoir releases for prescribed flood control space. The summer trend is most obvious at Verdi and Washoe Diversion Dams where average bypass flows under current conditions, No Action, and TROA 50 during late summer rarely equal or exceed the minimum fish flow of 150 cfs, thus reducing fish habitat.

Table 3.117—Average monthly bypass flows, based on the 100-year period of analysis, at each of the four diversion dams under current conditions, No Action, and TROA 50

Average monthly bypass flows (cfs)												
Current Conditions												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Farad	214	200	267	357	474	535	790	1240	894	338	184	156
Fleish	203	144	230	342	470	582	867	1301	906	341	171	138
Verdi	158	115	202	317	438	538	802	1231	840	275	108	77
Washoe	144	121	209	326	447	541	777	1185	796	235	84	64
No Action												
Farad	246	201	264	353	466	528	776	1215	866	314	162	152
Fleish	257	142	222	331	456	570	843	1266	911	350	185	154
Verdi	203	114	194	304	423	522	778	1197	843	282	120	90
Washoe	188	118	197	311	426	516	748	1151	797	241	80	58
TROA 50												
Farad	174	109	205	309	434	538	831	1273	869	263	98	68
Fleish	235	124	234	351	486	609	912	1344	938	329	162	131
Verdi	177	114	218	335	459	567	846	1274	868	260	95	66
Washoe	160	119	220	341	460	564	805	1230	823	222	68	59

The only relevant difference between No Action and TROA occurs at Farad Diversion Dam during August and September. Under TROA 50, average bypass flows at Farad during these months are about 50 to 90 cfs less than under No Action. In contrast, TROA

200, because of a potentially large volume of Fish Water in Stampede and Prosser Creek Reservoirs, would likely yield average bypass flows at Farad during these months that are equal to or greater than those under No Action.

Average annual bypass flows simulated by the operations model are displayed in figure 3.37 as exceedence probability, i.e., the likelihood that a value for a certain parameter would be equaled or exceeded during the period of analysis. These data indicate that minimum bypass flows are achieved at all diversion dams under current conditions and the alternatives. However, because the minimum bypass flow at Farad Diversion Dam under current conditions and No Action is 150 cfs, the exceedence probabilities for 100 cfs and 150 cfs are nearly double those under TROA 50. With the exception of flows from 50 to 150 cfs at Farad Diversion Dam under current conditions and No Action, exceedence probabilities for achieving bypass flows greater than 50 cfs diminish appreciably under current conditions and the alternatives.

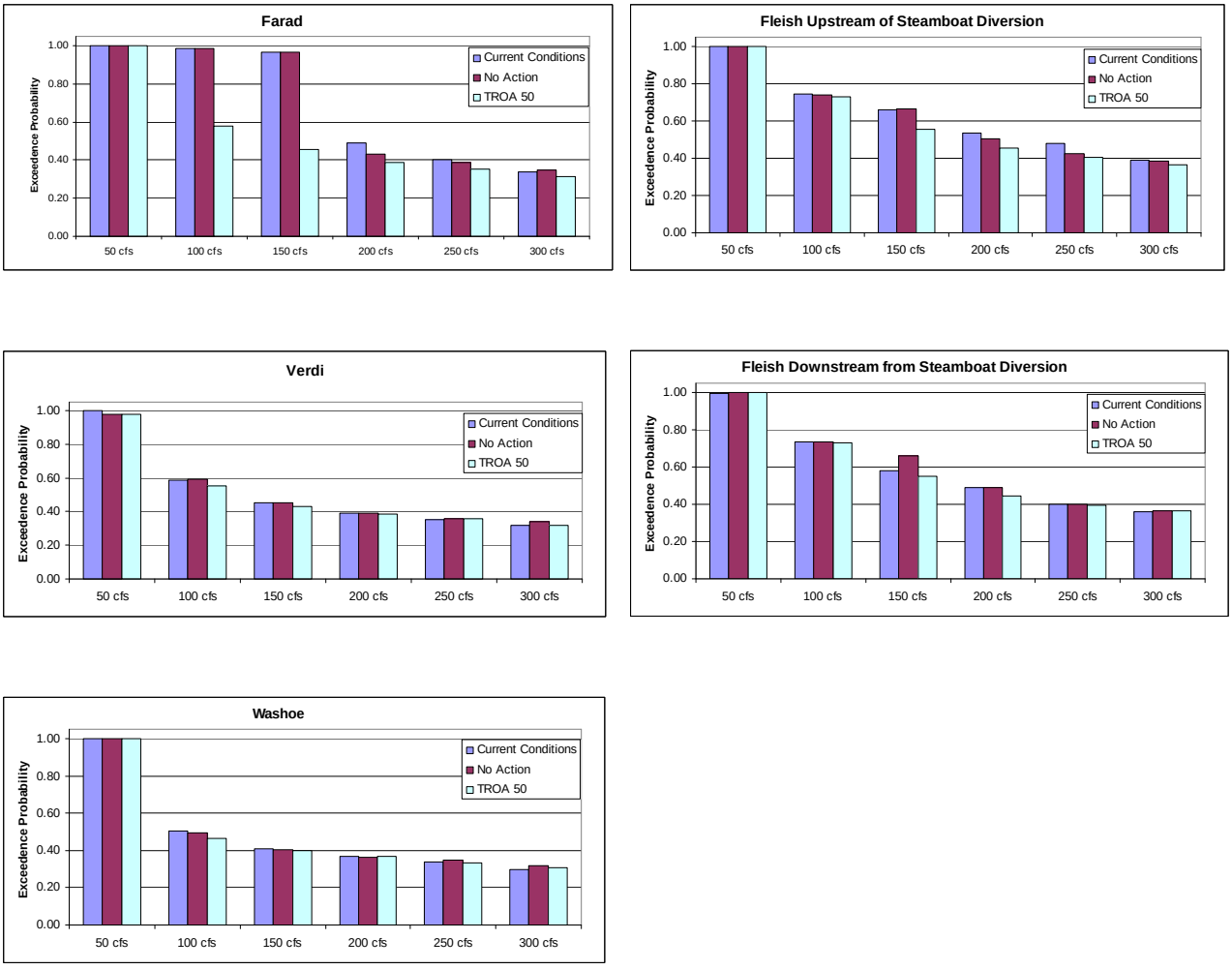

Figure 3.37—Average annual bypass flow exceedence probabilities associated with Farad, Fleish, Verdi, and Washoe Diversion Dams under current conditions and the alternatives.

The success of bypass flows to achieve CDFG minimum (150 cfs) and optimum (250 cfs) fish flows varies among the diversion dams under current conditions and the alternatives. The highest exceedence probability for achieving minimum fish flow is 0.97 at Farad Diversion Dam under current conditions and No Action, and the lowest is 0.40 at Washoe Diversion Dam under TROA 50. The highest exceedence probability for achieving optimum fish flow is 0.48 at Fleish Diversion Dam under current conditions, and the lowest is 0.33 at Washoe Diversion Dam under TROA 50.

With the exception of bypass flows equal to or less than 150 cfs at Farad Diversion Dam under current conditions and No Action, there are generally only slight differences—one or two points—in the average annual exceedence probabilities among current conditions and the alternatives for a given bypass flow. This is especially true for Verdi and Washoe Diversion Dams at all bypass flow values and for all diversion dams at bypass flows of 200 cfs, 250 cfs, and 300 cfs. The greatest difference occurs at Fleish Diversion Dam where No Action is 11 points greater than TROA 50 at a bypass flow of 150 cfs.

Diversions to Steamboat Ditch under current conditions have a notable effect on flows in the Fleish bypass reach. Exceedence probabilities for bypass flows greater than 100 cfs decrease by 3 to 8 points between the upper and lower sections of the bypass reach under current conditions. In contrast, exceedence probabilities for all bypass flows under the alternatives either do not change or decrease by only one or two points between the two sections of the bypass reach, which reflects greater monthly diversions under current conditions than under the alternatives (table 3.117).

Generally, exceedence probabilities under TROA 50 are slightly less than under current conditions and No Action. Lower exceedence probabilities under TROA 50 are due to Credit Water establishment that reduces flows at the diversion dams and to management restrictions under TROA 50 on the use of Fish Water to enhance bypass flows.

It can reasonably be concluded that TROA 200 would yield bypass flow exceedence probabilities at all four diversion dams similar to those at Farad Diversion Dam under No Action and current conditions, thus enhancing fish habitat in the river bypass reaches associated with each diversion dam in comparison to current conditions, No Action, and TROA 50. The higher exceedence probabilities at Fleish, Verdi, and Washoe would be achieved by managing the large volume of Fish Water in Stampede and Prosser Creek Reservoirs specifically to enhance bypass flows at the four diversion dams. Therefore, the range of potential water management scenarios under TROA produces a range of potential impacts.

VI. Discussion

Depending on how water is managed under TROA, the amount of fish habitat in the river associated with the four hydroelectric diversion dams would range from less than under No Action and current conditions in the Farad reach, to the same as or greater than under No Action and current conditions in all four reaches. A minimum bypass requirement of

150 cfs at Farad Diversion Dam under current conditions and No Action has nearly twice the potential for enhancing fish habitat in the Farad reach as under TROA 50, while the potential under TROA 200 would likely be the same as under current condition and No Action. Benefits of the 150 cfs minimum bypass at Farad do not extend downstream to the other diversion dams because the minimum bypass requirement at these three facilities is only 50 cfs. Potential benefits for fish habitat in these three reaches are similar under current conditions, No Action, and TROA 50. Under TROA 200, there would be a net gain in potential benefits for fish habitat in the Little Truckee River - Hunter Creek reach because the same benefits experienced in the Farad reach would extend downstream to the other diversion dams.

Fish habitat enhancement under TROA is possible because of the large amount of Fish Water that could be stored in and released from Stampede and Prosser Creek Reservoirs and provisions that would allow owners of such water to enhance bypass flows at all four diversion dams. The prospects for fish would be further enhanced under TROA 200 by potential releases of California Environmental Credit Water and Additional California Environmental Credit Water to enhance bypass flows.

The benefit of TROA bypass flow provisions (sections 7.A.6(c) and 9.E.2 of the Negotiated Agreement) is that bypass flows need not be static, but may be varied according to the needs of the species (management objectives) in the bypass reach. Because use of Fish Water for bypass flows is at the discretion of the United States and the Pyramid Tribe, and the use of California Environmental Credit Water and Additional California Environmental Credit Water is at the discretion of California, benefits of these water categories can best be realized through cooperative fish resource management among California, Nevada, the United States, and the Pyramid Tribe. Development of integrated or coordinated fish resource management plans and habitat restoration activities would allow for the most diverse, efficient, and beneficial use of Fish Water, Fish Credit Water, California Environmental Credit Water, Additional California Environmental Credit Water, and Joint Program Fish Credit Water. Use of these water categories to enhance bypass flows is likely since it is the objective of FWS and the Pyramid Tribe to re-establish LCT throughout the Truckee River.

The wide range of potential water management scenarios indicates that TROA could have a wide range of impacts on the riverine environment; not only in the river reaches associated with the hydroelectric diversion dams, but throughout the length of the river and its tributaries. When Fish Water is managed under TROA to achieve the six-flow regime (as in the operations model), TROA would, with the exception of the Farad reach which is less than two percent of the river length, either maintain the status quo or significantly enhance fish habitat in the river from Lake Tahoe to Pyramid Lake and portions of three tributaries, including Independence Creek ("Fish In Truckee River and Affected Tributaries") as well as benefit threatened and endangered fishes of Pyramid Lake. (See "Cui- ui" and "Lahontan Cutthroat Trout.") An additional benefit of TROA, though not fully analyzed in this final EIS/EIR because water managers have yet to develop the necessary plans, is the flexibility it allows in the use of Fish Water and Fish Credit Water to improve riverine conditions (e.g., water quality) and reservoir releases

(e.g., ramping changes; sections 5.B.6, 5.B.7(h), 5.B.8, 8.K, 9.C, and 9.E.2 of the Negotiated Agreement) for fish resources. As such, TROA would provide benefits to fish in the Truckee River and portions of three tributaries that are not provided under current conditions and No Action. These benefits more than offset the reduced potential to enhance fish habitat in the Farad reach.

Maintenance of the 150 cfs minimum bypass requirement at Farad Diversion Dam under current conditions and No Action would likely cause a reduction, if not elimination, of power generation at the Farad hydroelectric powerplant during many months of the year. Power generation at the other plants would not be affected because the minimum bypass flow requirement under TROA would be the same as under No Action or current conditions. TROA 200 would not affect power generation at the four river sites because Fish Water would be a supplemental release to the river, i.e., it would not reduce diversions to the hydroelectric powerplants.

WATER RIGHT PETITIONS AND APPLICATIONS

As noted in chapter 1, Reclamation, WCWCD, and TMWA have filed two water appropriation applications, four petitions for change, and two time extension petitions (petitions and applications) with SWRCB. (See the SWRCB Notice of Petitions and Water Appropriation Applications Appendix for greater detail.) The purposes of the two applications are to: (1) allow the full capacity of Stampede Reservoir to be used, (2) remove the maximum withdrawal restriction from Prosser Creek Reservoir, and (3) allow an October 1 through August 10 diversion period for Prosser Creek Reservoir. The four change petitions—for each of Prosser Creek, Boca, and Stampede Reservoirs and Independence Lake,—and the two water appropriation applications seek to include common points of diversion[15], rediversion[16], and redistribution[17] of storage, places of use, and purposes of use so that water can be exchanged, stored, and diverted efficiently among these reservoirs, along with Donner Lake and Lake Tahoe, to implement TROA. The two time extension petitions filed for Stampede Reservoir by Reclamation seek additional time to develop the water right associated with Permit No. 11605. Implementation of the operations identified in the proposed petitions and applications is predicated on approval and implementation of TROA; however, implementation of TROA is predicated only on the approval of the proposed change petitions. TROA would supersede all requirements of any agreements concerning the operation of Truckee River reservoirs, including those of TRA and TPEA, and would become the sole operating agreement for these reservoirs.

I. Existing Water Right Licenses and Permits

A. Prosser Creek—Application No. 18006, License No. 10180, Water Right Holder: Reclamation

This license is for 30,000 acre-feet of storage from April 10 to August 10 of each year. It restricts the maximum withdrawal from storage in any one year to 20,162 acre-feet. The point of diversion to storage is at Prosser Creek Dam, in Section 30, Township (T) 18 North (N), Range (R) 17 East (E), MDB&M (Mount Diablo Baseline & Meridian). The purposes of use are irrigation, domestic, municipal, industrial, fish culture, and

[15] "Point of diversion" means the point on a natural watercourse where water is initially taken under control (i.e., either diverted away from the watercourse in a conduit or placed into seasonal storage in a reservoir at the point of diversion) under a water right for the purpose of making a beneficial use of water.

[16] "Point of rediversion" means a point on a natural watercourse where water that was previously taken under control—under a water right for the purpose of making a beneficial use of water—is taken under control again (i.e., either diverted away from the watercourse in a conduit or placed into seasonal storage in a reservoir at the point of rediversion). This water was either released from seasonal storage upstream or imported into the watercourse on which the point of rediversion is located.

[17] "Redistribution" means that a quantity of water, which would have been or is physically stored in a reservoir under a license (or permit), may be stored in another reservoir under the same license (or permit).

recreation. The place of use is at the reservoir (in California) and in Truckee Meadows and the Newlands Project in Nevada. As required in the license, the project is operated primarily to allow water, which might not otherwise be available from Lake Tahoe to help meet Floriston Rates, to be released from Lake Tahoe in exchange for a like amount of water to be stored in Prosser Creek Reservoir. This is done under TPEA (described in chapter 2). The only other water stored in Prosser Creek Reservoir is used for the conservation of threatened and endangered fishes of Pyramid Lake.

B. Boca Reservoir—Application No. 5169, License No. 3723, Water Right Holder: WCWCD

This license is for 40,850 acre-feet of storage from about October 1 of each year to about July 1 of the succeeding year. The point of diversion to storage is at the dam in Section 21, T18N, R17E, MDB&M. There are numerous points of rediversion in Nevada. The purposes of use are irrigation and domestic. The place of use is WCWCD in Nevada. The reservoir is used to store water that can be released to help achieve Floriston Rates, and for flood control.

C. Stampede Reservoir—Application No. 15673, Permit No. 11605, Water Right Holder: Reclamation

This permit is for 126,000 acre-feet of storage from January 1 to December 31 of each year, and for 350 cfs of direct diversion from about April 1 to about November 1 of each year. The point of diversion is at Stampede Dam in Section 28, T19N, R17E, MDB&M. There are numerous points of rediversion in Nevada. The purposes of use are domestic, municipal, industrial, irrigation, flood control, fish culture, and recreation. Hydroelectric power is generated at the dam incidental to releases made for the approved purposes of use. Places of use are Truckee Meadows and the Newlands Project in Nevada. The reservoir also provides a measure of flood control. Stampede Reservoir currently stores Project Water. SWRCB conditioned the permit as follows:

> "If and when an interstate compact covering the distribution and use of the waters of the Truckee and Carson Rivers is approved by the Legislatures of the States of California and Nevada and is consented to by Congress, the operation of Stampede Reservoir shall be in conformance with such compact, and the terms and conditions set forth in these permits which are in conflict thereto shall not apply. The Board retains jurisdiction for the purpose of amending the terms of these permits to conform to the terms of such compact." (State Water Resources Control Board, Decision No. D 913, September 25, 1958)

In 1982, the Ninth Circuit Court of Appeals upheld the ruling of the United States District Court for the District of Nevada that the Secretary shall use storage in Stampede Reservoir for the conservation of threatened and endangered fishes of Pyramid Lake

because their status under the Endangered Species Act of 1973 took precedence over any obligation for delivery of water for irrigation and M&I uses. This ruling guides current operations of Stampede Reservoir.

D. Independence Lake—Application No. 9247, License No. 4196, Water Right Holder: TMWA

This license is for 17,500 acre-feet of storage from about December 1 of each year to about July 1 of the succeeding year. The point of diversion is at the dam in Section 35, T19N, R15E, MDB&M. There are several points of rediversion in Nevada. The purpose of use is municipal. The place of use is the cities of Reno and Sparks, Nevada. TMWA also claims a pre-1914 appropriative water right, and holds a separate license for generation of hydroelectric power; however, neither of these rights is part of the change petition.

II. Petitions and Applications

Approval of the change petitions would retain existing points of diversion and rediversion, places of use, and purposes of use for the four reservoirs, and would (1) redistribute storage in Boca Reservoir, Stampede Reservoir, and Independence Lake; (2) add points of diversion and rediversion; (3) expand the place of use to provide for a common place of use under each license and permit; and (4) add purposes of use so that each license and permit has the same purposes of use, except that Independence Lake is not used for flood control purposes. Approval of the two appropriation applications would allow (1) the full capacity of Stampede Reservoir to be used, (2) removal of the maximum withdrawal restriction from Prosser Creek Reservoir, and (3) an October 1 through August 10 diversion period for Prosser Creek Reservoir. Approval of the two time extension petitions for Stampede Reservoir would allow time to develop this water right pursuant to TROA.

Under TROA and the change petitions necessary to implement TROA that are analyzed in this EIS/EIR, water may be stored in each Truckee River Reservoir via three mechanisms: (1) diversion to storage of Project Water, which is the current use of the reservoir, (2) exchanges from other reservoirs, and (3) diversion to storage in lieu of the exercise of direct diversion water rights. Project Water includes unappropriated water that would be stored as a result of approving the applications. Other reservoirs from which exchanges would be made, exclusive of the subject reservoir, are Lake Tahoe, Donner Lake, Prosser Creek Reservoir, Independence Lake, Stampede Reservoir, and Boca Reservoir. Direct diversion water rights would be available from existing or purchased water rights in California or Nevada.

At any time, water could be stored by any or all of these mechanisms. Annual diversions to storage of Project Water could be no more than what is currently allowed in the SWRCB permit/license for the specific reservoir, as supplemented by the applications.

While this Project Water is being stored, exchanges into and out of a reservoir could be made multiple times, each up to the extent the reservoir has unused storage space. Similarly, diversions to storage in lieu of direct diversions could be made multiple times, utilizing unused storage, and subsequently released to serve the use specified for the direct diversion, or exchanged to another reservoir to later serve that use.

A. Change Petitions for Stampede (No. 15673), Boca (No. 5169), and Prosser Creek Reservoirs (No. 18006), and Independence Lake (No. 9247)

Stampede, Boca, and Independence Dams would have common upstream and downstream points of diversion, rediversion, and redistribution. Prosser Creek Dam would continue to be the diversion point for Prosser Creek Reservoir. Numerous common points of rediversion would be added downstream from Independence and Prosser Creek Dams to Pyramid Lake, including Derby Diversion Dam and the Newlands Project. In general, expanded places of use would include the upper Truckee River basin, Truckee Meadows, Fernley area, Newlands Project, and Pyramid Lake Indian Reservation. (For more details about the places of use, see table D and Map No. 320-208-189A-1 in the SWRCB Notice of Petitions and Water Appropriation Applications Appendix.) This expansion of the place of use would allow for potential exchanges of Project Water among the reservoirs in accordance with TROA. Incidental power generation would be authorized at the Stampede, Farad, Fleish, Verdi, and Washoe hydroelectric powerplants. (The Stampede hydroelectric powerplant is not included in the Prosser Creek Reservoir change petition.) Purposes of use would be expanded so that water from the four reservoirs has the following common uses: municipal, domestic, industrial, irrigation, stock watering, fish and wildlife protection/enhancement, fish culture, hydropower generation, instream water quality enhancement, recreation, conservation of Pyramid Lake fishes, and, except for Independence Lake, flood control.

B. Stampede Reservoir—Application No. 31487

This application would supplement the current permit (No. 11605) for Stampede Reservoir. If approved, the total combined amount of water that could be taken from January 1 through December 31 by direct diversion at the rate of 350 cfs and diversion to storage would be 226,500 acre-feet, which represents an increase of 100,000 acre-feet over the amount under the current permit for the reservoir.

Water available for diversion to storage under this application would be water in the Little Truckee River basin upstream of Stampede Reservoir that would otherwise flow to Pyramid Lake. In accordance with TROA, the storage priority of this water would not impair the exercise of vested or perfected direct diversion water rights, and would not constrain or limit the operation of other Truckee River reservoirs.

C. Prosser Creek Reservoir—Application No. 31488

This application would supplement the current license (No. 10180) for Prosser Creek Reservoir. Its approval would remove the existing maximum withdrawal of 20,162 acre-feet in any one year and would change the filling period from April 10–August 10 to October 1–August 10, while continuing to allow a maximum annual storage of 30,000 acre-feet as under the existing license. This would increase the potential annual withdrawal from the reservoir by 9,800 acre-feet.

Water available for diversion to storage under this application would be water in the Prosser Creek basin upstream of Prosser Creek Reservoir that would otherwise flow to Pyramid Lake. In accordance with TROA, the storage priority of this water would not impair the exercise of vested or perfected direct diversion water rights, and would not constrain or limit the operation of other Truckee River reservoirs.

D. Time Extension Petitions (No. 15673)

The two time extensions are necessary to develop the water right associated with Permit No. 11605 (including Application No. 31487 supplement) and to put such water to full beneficial use. A 10-year time extension petition was granted in 1982, and Reclamation petitioned for another 10-year extension in 1992, but the request was placed on hold while TROA negotiations continued. The current petition (No. 15673) seeks approval of the 1992 petition and requests an additional 10-year extension. The total time extension from 1982, including the 10-year extension already granted and two 10-year extensions requested, would be 30 years, effective to 2012.

III. Evaluation Process

SWRCB must consider a number of factors when acting on a change petition:

- That the proposed change will not injure any other legal user of water (California Water Code [CWC] section 1702)
- That the proposed change will not in effect initiate a new right (California Code of Regulations [CCR] title 23, section 791)
- That the intended use is beneficial

SWRCB must also consider a number of factors when acting on an application to appropriate water:

- That unappropriated water is available for appropriation (CWC section 1375(d)).

- The instream flows required to protect beneficial uses of water, including uses identified in a water quality control plan (*Id*. section 1243.5). Beneficial uses include the use of water for recreation and the preservation and enhancement of fish and wildlife (*Id*. section 1243).

- That the water use, method of use, and method of diversion are reasonable, in accordance with article X, section 2 of the California Constitution. (Also see CWC section 275.)

- The effect of the project on public trust resources and protection of those resources where feasible.

Evaluation of the environmental effects of the above actions should consider the following:

- Effects of changes in flows as they relate to fishery, riparian habitat, and water quality issues.

- Effects of adding to places of use.

- Effects of adding purposes of use.

- Miscellaneous: Economic or social effects of a project shall not be treated as a significant effect on the environment, but may be used to determine the significance of the physical changes caused by the project (CCR, title 14, section 15131(a)-(b)).

IV. Summary of Effects

This section presents a compilation of environmental information required by CEQA and additional information provided to assist SWRCB in its decision making process, as described in "Evaluation Process," taken from other sections of this EIS/EIR.

A. Change Petitions that are Implemented with TROA

1. No Injury to Any Other Legal User of Water

By incorporating existing storage priorities and capacities for Project and Private Waters in their respective reservoirs, TROA would not impair or conflict with the exercise of vested or perfected *Orr Ditch* decree water rights or interfere with flood control and dam safety criteria. As discussed in chapter 1 and required by the Settlement Act, TROA must "ensure that water is stored in and released from Truckee River facilities to satisfy the exercise of water rights in conformance with the *Orr Ditch* and *Truckee River General Electric* decrees." TROA Section 1.C protects owners of vested and perfected water rights and provides compensation if implementation of TROA results in an owner

"not receiving the amount of water to which that owner is legally entitled." The one exception is that, since TROA would call for the modification of the *Orr Ditch* and *Truckee River General Electric* decrees, some parties signing TROA voluntarily agree to operations that prevent the full exercise of their water rights. An example is that the United States and Pyramid Tribe must sometimes, under TROA, reduce diversions to Stampede Reservoir storage to allow greater releases to meet higher minimum instream flows than are currently required. Such parties are not claiming injury since they obtain other benefits from storing water under TROA.

Section 204(c)(1) of the Settlement Act and TROA section 6.C assign diversions in the Truckee River basin in California the fourth highest priority, which is higher than the priority of any diversions to the reservoirs specified in the change petitions and applications. An exception in the Settlement Act is that diversions in California initiated after 1990 for commercial, irrigated agriculture are assigned a priority junior to all beneficial uses in Nevada. In any case, the Settlement Act and TROA would preclude water use in the Truckee River basin in California that exceeds the interstate allocation of 32,000 acre-feet per year of which 10,000 acre-feet per year may be surface water use.

In addition, any legal user of water may obtain storage in the subject reservoirs under TROA, provided they agree to comply with its provisions (TROA sections 7.A.2(b) and 7.G), and thus realize the benefits associated with such opportunities for storage and increased operational flexibility in exercising their water right.

2. Does Not in Effect Initiate a New Right

The four change petitions would add common purposes of use and common points of diversion, redistribution, and rediversion. Other terms in the existing permits would not change, except as may be granted by approval of the two applications.

3. That the Intended Use is Beneficial

The change petitions would aggregate existing purposes of use that have been previously approved for the four subject reservoirs, making these purposes of use applicable to all four reservoirs. These beneficial uses are described throughout this chapter.

4. Effects on Changes in Flows as they Relate to Fishery, Riparian Habitat, and Water Quality Issues

Granting the change petitions necessary to implement TROA would have no overall adverse effect on the riverine environment. When Fish Water is managed under TROA to achieve the six-flow regime in the lower reach of the Truckee River, TROA would, with the exception of the Farad reach (which is less than 2 percent of the river length), either maintain the status quo or significantly enhance fish habitat in the river from Lake Tahoe to Pyramid Lake and portions of three tributaries, including Independence Creek. (See "Fish in Truckee River and Affected Tributaries.") As such, TROA would provide benefits to fish in the Truckee River and portions of three tributaries that are not provided under current conditions and No Action. These benefits more than offset the reduced potential to enhance fish habitat in the Farad reach.

Though the minimum bypass flow under TROA (50 cfs) would be the same at all four Truckee River hydroelectric diversion dams, TROA would provide more operational flexibility in achieving bypass flows greater than 50 cfs than under LWSA, No Action, and current conditions. The benefit of the TROA bypass flow provisions is that minimum bypass amounts need not be static, but may be varied (managed) according to the needs of the species (management objectives) in the bypass reach. (See "Minimum Bypass Flow Requirements for TMWA's Hydroelectric Diversion Dams on the Truckee River.")

Article Nine of TROA requires minimum releases from the reservoirs that equal or exceed existing minimum releases. Article Nine also requires exchanges of water among reservoirs when there is low risk to TROA parties in accordance with existing water rights to further increase reservoir releases to those recommended by CDFG. The resulting benefits to instream flows are described in "Fish in Truckee River and Affected Tributaries."

TROA would have no adverse effects on endangered or threatened species under any hydrologic condition when compared to No Action or current conditions, and would have significant beneficial effects to both cui-ui and LCT (tables 3.60-3.70). Results of analyses on special status species associated with riparian or riverine habitats are discussed in "Habitat for Other Special Status Animal Species;" no adverse effect would result from TROA in any hydrologic condition.

Depending on the reach and the hydrologic condition, TROA either would have no effect or would have a significant beneficial effect on riparian habitats and associated wildlife along the mainstem of the Truckee River when compared to No Action and current conditions (table 3.66). TROA would have a significant beneficial effect on riparian habitats and associated wildlife along most tributary reaches in all hydrologic conditions and would have no effect along a few tributary reaches compared to No Action and current conditions (table 3.67).

5. Effects on Adding Places and Purposes of Use

Consolidating places and purposes of use under each license and permit would have no adverse effect because they are already, as an aggregate, common to the existing licenses and permit. Water right owners and the environment would benefit from having common places and purposes of use for Boca, Prosser Creek, and Stampede Reservoirs and Independence Lake because that would allow Credit Waters to be stored in and exchanged among these reservoirs, along with Lake Tahoe and Donner Lake. Also, Project Waters and Private Waters could be stored in and exchanged among the facilities. These operations would increase the availability of such waters for their beneficial uses and, in so doing, many benefits of TROA as described in this chapter would be realized. To allow implementation of TROA, new places and purposes of use are required in California and Nevada.

6. Economic and Social Effects

The economic and social effects of TROA are described in the "Economic Environment" and "Social Environment" sections of this chapter.

7. Other Environmental Effects

Other environmental effects at Prosser Creek, Stampede, and Boca Reservoirs and Independence Lake related to the petitions and applications are summarized as follows.

a. Prosser Creek Reservoir/Creek

Operations model results show that, in wet hydrologic conditions, Prosser Creek Reservoir releases are the same under TROA as under No Action or current conditions. In median hydrologic conditions, storage under TROA generally is greater from April through September than under No Action or current conditions; in Prosser Creek, flows are less in May and June, but much greater in September and October than under No Action or current conditions. In dry hydrologic conditions, storage under TROA is much greater and releases are less in May and June than under current conditions. Releases under TROA are much greater in September and October than under No Action or current conditions.

With approval of the change petitions, preferred flows in Prosser Creek for rainbow trout would be achieved 10 percent more frequently under TROA than under No Action or current conditions. (See "Fish in Truckee River and Affected Tributaries.") As a result, spawning, incubation, and rearing of rainbow trout would be enhanced in this reach.

Operations model results show that, under TROA, Prosser Creek Reservoir storage is below the minimum threshold for fish survival in about half as many years as under No Action and in nearly 30 percent fewer years than under current conditions. (See "Fish in Lakes and Reservoirs, Fish Survival Based on Minimum Storage Thresholds.") As a result, with approval of the change petitions, fish mortality would be substantially less under TROA, which would be a significant beneficial effect.

TROA would have no effect on riparian and wetland vegetation in Prosser Creek Reservoir. Operations model results show that reservoir storage is slightly less under TROA during August and September in wet hydrologic conditions than under No Action or current conditions. (See "Reservoir Storage and Releases" in "Surface Water.") Several years of wet hydrologic conditions may, therefore, allow the temporary expansion of emergent wetlands in the basin of the reservoir. Storage in median and dry hydrologic conditions under TROA is well within the existing operational basin of the reservoir and would not result in a significant adverse effect on existing riparian or wetland vegetation.

b. Stampede Reservoir/Little Truckee River

Operations model results show that, under TROA, Stampede Reservoir storage in wet hydrologic conditions is greater from May through September, and releases are greater from September through December than under No Action or current conditions. In

median hydrologic conditions, storage under TROA is much greater than under No Action or current conditions, while releases are less from November through August, but much greater in October. In dry hydrologic conditions, storage and releases under TROA are much greater year-round than under No Action or current conditions. With approval of the change petitions, minimum flows for brown trout would be sustained more frequently under TROA than under No Action or current conditions.

Under TROA, Stampede Reservoir storage is below the minimum threshold for fish survival in 9 percent fewer years than under No Action and in nearly 13 percent fewer years than under current conditions. (See "Fish in Lakes and Reservoirs.") As a result, with approval of the change petitions, fish mortality would be substantially less, which would be a significant beneficial effect. (See "Fish in Lakes and Reservoirs.")

Stampede Reservoir provides foraging habitat for migrating waterfowl, primarily on islands within the reservoir. In wet and median hydrologic conditions, TROA would have no significant effect on shallow water foraging habitat for waterfowl and shorebirds when compared to No Action or current conditions. In dry hydrologic conditions, with approval of the change petitions and applications, nearly 80 percent more shallow water foraging habitat would be available under TROA than under current conditions, which would be a significant beneficial effect. (See "Waterfowl and Shorebirds.") Under TROA, predator access to islands in Stampede Reservoir would occur in about 50 percent fewer years with approval of the change petitions and applications than under No Action or current conditions; again, this would be a significant beneficial effect. Under TROA, island bird nests would be inundated about 5 percent more frequently than under No Action and about 20 percent more frequently than under current conditions, which would have the potential to adversely affect local, but not regional, Canada goose nesting success.

The small amount of riparian and wetland vegetation at Stampede Reservoir occurs where the Little Truckee River and Sagehen Creek enter the reservoir. The complexity of the topography and substrate characteristics make it difficult to predict the actual pattern of change that might occur, but, because of soil porosity, no significant adverse effect on riparian and wetland vegetation is expected.

c. Boca Reservoir

Operations model results show that, under TROA, in wet hydrologic conditions, reservoir storage is greater from October through December and less in August than under No Action or current conditions. In median hydrologic conditions, storage under TROA is greater from August through March and, in dry hydrologic conditions, greater year-round than under No Action or current conditions.

Under TROA, Boca Reservoir storage is below the minimum threshold for fish survival in 33 percent fewer years than under No Action and in 35 percent fewer years than under current conditions. (See "Fish in Lakes and Reservoirs.") As a result, with the approval of the change petitions, fish mortality would be substantially less under TROA, which would be a significant beneficial effect. Operations model results show slightly less

reservoir storage from July through September under TROA in wet hydrologic conditions than under No Action or current conditions. (See "Reservoir Storage and Releases" in "Surface Water.") Several years of wet hydrologic conditions may, therefore, allow the temporary expansion of emergent wetlands into the operational basin of the reservoir. Storage in median and dry hydrologic conditions under TROA is well within the existing operational basin of the reservoir and would not result in a significant adverse effect on existing riparian or wetland vegetation.

d. Independence Lake and Creek

Operations model results show that, under TROA, Independence Lake storage and releases generally are the same as under No Action. However, in dry hydrologic conditions, storage is greater from July through September and less from November through June; releases are greater from May through September. Approval of the change petitions would result in a number of potential benefits to fish resources at Independence Lake that would not occur otherwise. For example, Article Five of TROA allows Joint Program Fish Credit Water, Fish Credit Water, and Fish Water in Stampede and Boca Reservoirs to be exchanged for Private Water in Independence Lake for the conservation of LCT in the lake. TMWA would allow CDFG to maintain access through the delta at the upper end of the lake for migrating fish. Also, TROA could improve the timing and duration of flows in Independence Creek during summer months.

No minimum threshold for fish survival has been established for Independence Lake. Except for certain months in dry hydrologic conditions, operations model results show similar storage under all hydrologic conditions; thus, no effect on lake fish is expected. The average total area of shallow water fish spawning habitat is the same under TROA and No Action in wet and median hydrologic conditions and differs by less than 8 percent in dry hydrologic conditions, which is not a significant effect. Spawning habitat under TROA is the same as under current conditions. (See "Fish in Lakes and Reservoirs.") Because Independence Lake provides limited habitat for waterfowl and shorebirds, no significant effects would be expected on these resources under TROA.

Preferred flows for rainbow trout likely would occur more frequently with approval of the change petitions. (See "Fish in Truckee River and Affected Tributaries.") Lethal flow conditions would occur significantly less frequently, and rainbow trout spawning, incubation, and rearing would be enhanced.

B. Water Appropriation Applications that may be Implemented with TROA

1. Unappropriated Water Available for Appropriation

Water available for diversion to storage under Application No. 31487 (Stampede Reservoir) would be water in the Little Truckee River basin upstream of Stampede Reservoir that would otherwise flow to Pyramid Lake. The application seeks to allow use of the full capacity of the existing reservoir for the purpose of storing Project Water and Fish Credit Water in accordance with TROA and, in turn, would expand the benefits

derived from TROA. As such, the storage priority of this water would not impair the exercise of vested or perfected direct diversion water rights and would not constrain or limit the operation of other Truckee River reservoirs.

Application No. 31488 (Prosser Creek Reservoir) proposes to expand the storage season and to change the maximum withdrawal amount from Prosser Creek Reservoir to the maximum storage of the reservoir in accordance with TROA. The application seeks to allow use of the full capacity of the existing reservoir in accordance with TROA and, in turn, would expand the benefits derived from TROA. Water available for diversion to storage under this application would be water in the Prosser Creek basin upstream of Prosser Creek Reservoir that would otherwise flow to Pyramid Lake. As such, the priority storage of this water would not impair the exercise of vested or perfected direct diversion water rights, and would not constrain or limit the operation of other Truckee River reservoirs.

2. Instream Flows Required to Protect Beneficial Uses of Water

Article Nine of TROA requires minimum releases from the reservoirs that equal or exceed existing minimum releases. Article Nine also requires exchanges of water among reservoirs, when they may be done with low risk to TROA parties in accordance with existing water rights, to further increase reservoir releases to those recommended by CDFG. Approving the applications would provide additional storage of Fish Credit Water, which must be made available for such exchanges to better meet the recommended releases. The resulting benefits to instream flows are described in the "Biological Resources" section of this chapter.

3. That the Water Use, Method of Use, and Method of Diversion are Reasonable

In determining what constitutes a reasonable use of water or method of use or diversion, the totality of the circumstances must be reviewed along with the specific facts of each case. Water use, method of use, and method of diversion associated with the applications are reasonable because approval of the applications and implementation of TROA would allow (1) water rights to be exercised more effectively and efficiently and (2) reservoirs to be operated more effectively and efficiently in that currently unused reservoir storage space would be used. In addition to better meeting the storage and diversion objectives of water rights holders, uses of water stored and released under these applications would provide benefits to aquatic resources in the Truckee River and in three of its major tributaries. (See Section IV, "TROA," in chapter 2 and table 2.6, along with "Biological Resources" sections in this chapter for details.)

Beneficial uses of water proposed under these applications, as well as those under the proposed change petitions, simply consolidate existing purposes of use, which have been previously approved for the subject reservoirs.

4. The Effect of the Applications on Public Trust Resources and Protection of Those Resources Where Feasible

The California public trust doctrine, as set forth in *National Audubon Society* v. *Superior Court of Alpine County*, 33 Cal. 3d. 419, 658 P.2d 709 (1983), requires the State to protect public trust resources, such as fish and wildlife, recreation, and environmental values. The State has an affirmative duty to take the public trust into account in the planning and allocation of water resources, and no water right holder has a vested right to use water in a manner harmful to the trust. Section 1.A.3 of TROA re-affirms this public trust by stating: "this Agreement is intended to implement California's responsibilities under the public trust doctrine as set forth in *National Audubon Society v. Superior Court of Alpine County* . . . by coordinating operation of Truckee River Reservoirs, Donner Lake and Independence Lake, by supporting recreation and instream flows, and by providing for consultation with California, which will aid in balancing among public trust uses while meeting all other requirements of the Settlement Act." Since the two applications are conditioned on the implementation of TROA, California's responsibility under the public trust doctrine is assured.

The public trust doctrine has been understood to protect, among other things, public access, aesthetic values, ecology, fish and wildlife, habitat, and recreation. TROA would benefit and enhance these protected resources. For example, TROA provides for the establishment of Credit Water, certain categories of which would be used by California and others to enhance instream flows. TROA also provides for a habitat restoration fund to be used over 30 years by California, Nevada, and Pyramid Tribe to restore riverine habitat in the Truckee River system. Other ecological benefits are discussed in the "Biological Resources" sections of this chapter. TROA would not alter public access to the reservoirs. Other categories of Credit Water would enhance aesthetic values, especially for recreationists using these reservoirs. (See "Aesthetic Resources.") Additional storage at Prosser Creek Reservoir would increase visitor usage above that under No Action or current conditions. Use of boat ramps would be the same with or without TROA. Flows for recreational fishing in Prosser Creek would be slightly better under TROA than under No Action or current conditions. Recreational usage at Stampede Reservoir under TROA would be slightly greater than under No Action or current conditions.

5. Effects on Changes in Flows as they Relate to Fishery, Riparian Habitat, and Water Quality Issues

The effects on fishery, riparian habitat, and water quality issues are discussed under "Change Petitions that are Implemented with TROA" and in the "Biological Resources" sections of this chapter.

6. Economic and Social Effects

The economic and social effects of TROA are described in the "Economic Environment" and "Social Environment" sections of this chapter.

C. Time Extension Petitions

Since 1978, the Secretary has used storage in Stampede Reservoir for the conservation of threatened and endangered fishes of Pyramid Lake. Stampede Reservoir is managed for flood control and, to the maximum extent possible, to comply with the Secretary's obligation to Pyramid Lake fishes. This operation is expected to continue until and after TROA becomes effective.

The project includes Reclamation's petitions for two 10-year extensions of time to put the water under the Stampede permit to full beneficial use and to implement the requested change petitions. Approval of the time extensions would not result in an adverse change in the existing environment because Reclamation is already putting the full amount of water under its permit to beneficial use. Thus, the existing environment already includes those existing operations. There is no other environmental impact associated with a potential approval of the time extension petitions, other than any impacts associated with the change petitions that would be made possible by the extension of time. The impacts associated with those change petitions are fully documented herein.

GROWTH-INDUCING IMPACTS

Section 21100(b)(5) of CEQA requires an EIR to discuss the growth-inducing impact of a proposed project. Section 15126.2(d) of the CEQA Guidelines clarifies this requirement, stating that an EIR must address "the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment."

Under CEQA, growth-inducing impacts must not be assumed to be necessarily beneficial, detrimental, or of little significance to the environment. Induced growth is considered a significant impact only if it affects, directly or indirectly, the ability of agencies to provide needed public services or if it can be demonstrated that the potential growth, in some other way, significantly affects the environment. The goal of the EIS/EIR in this regard, therefore, is one of disclosure.

Generally speaking, a project is considered growth inducing when it:

- Directly or indirectly fosters (1) economic growth, (2) employment opportunities, (3) population growth, or (4) additional housing.
- Removes obstacles to growth.
- Burdens community infrastructure and service facilities (e.g., transportation, fire and police protection, schools, recreation facilities).
- Encourages or facilitates other activities that could significantly affect the environment.

In addition, NEPA regulations require an EIS to consider the potential indirect impacts of a proposed project. Indirect effects of an action include those that occur later in time or a distance away but that are still reasonably foreseeable (CEQ Guidelines section 1508.8(b)).

This section also notes that indirect effects can include "growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems."

Future population levels and water demands used in this final EIS/EIR are based on projections made by State and regional service and planning entities responsible for planning for M&I water supply and demand in the Lake Tahoe and Truckee River basins. For Truckee Meadows, these entities are Washoe County and Truckee Meadows Water Authority. For the California and other Nevada portions of the Lake Tahoe and Truckee River basins, these entities are California Department of Finance, CDWR, TRPA,

NDWR, Fernley, and the Pyramid Tribe. These entities have prepared extensive studies and reports variously forecasting the study area's economy, population, and resources. These studies and reports have been approved and adopted by the respective agencies, in cooperation with local jurisdictions, as the most likely scenarios for growth in these regions. Projections made by local planning entities indicate that population growth during the study period would be the same with or without the Federal action (TROA). Therefore, implementation of TROA would not be growth-inducing in the Lake Tahoe or Truckee River basins.

Although sources of water or mechanisms to meet water demands might differ among the alternatives, population growth and resulting water demand are projected to be the same under No Action, LWSA, and TROA. (See "Surface Water" and "Social Environment.") The projected changes are within the parameters of planning for growth within the study area, including land use, transportation, housing, schools, public services, environmental resources, and infrastructure. (Note: While planning efforts generally do not extend 26 years into the future, descriptions of all alternatives comport with projected population trends and projected changes do not achieve the threshold of substantial impact.)

ENVIRONMENTAL JUSTICE

I. United States

Executive Order 12898 (1994), "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," provides that each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. Environmental justice programs promote the protection of human health and the environment, empowerment via public participation, and the dissemination of relevant information to inform and educate affected communities.

II. California

Section 65040.12 of the California Government Code defines environmental justice as "the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies."

Under California's CEQA Guidelines, economic or social information may be included in an EIR, or may be presented in whatever form the agency desires. Economic or social effects of a project shall not be treated as significant effects on the environment (State of California CEQA Guidelines, Section 15131).

It is the policy of the California Resources Agency that the fair treatment of people of all races, cultures, and incomes shall be fully considered during the planning, decision-making, development, and implementation of all Resources Agency programs, policies, and activities. The intent of this policy is to ensure that members of the public, including minority and low-income populations, are informed of opportunities to participate in the development and implementation of all Resources Agency programs, policies, and activities and that they are not discriminated against, treated unfairly, or caused to experience disproportionately high and adverse human health or environmental effects from environmental decisions.

The mission of the California Environmental Protection Agency and its boards, departments, and offices is to accord the highest respect and value to every individual and community by developing and conducting its public health and environmental protection programs, policies, and activities in a manner that promotes equity and affords fair treatment, accessibility, and protection for all Californians, regardless of race, age, culture, income, or geographic location.

III. Conclusion

This section addresses potential environmental justice concerns in accordance with Federal and California environmental justice laws and policies.

As identified in Chapter 5, "Consultation and Coordination," public involvement (i.e., consultation and coordination with potentially affected publics) has continued throughout the EIS/EIR process for the proposed action. A review of "Economic Environment," "Social Environment," and "Indian Trust Resources" sections in this chapter 3 has shown that neither LWSA nor TROA involves facility construction, population relocation, health hazards, hazardous waste, property takings, or substantial economic impacts. Consequently, it is concluded that implementing LWSA or TROA would have no adverse human health or environmental effects on minority or low-income populations as defined by environmental justice policies and directives.

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are assumed to be long-term impacts to resources which would be affected by implementation of one of the action alternatives. Because the action alternatives involve only modifying reservoir operations, no unavoidable adverse impacts are expected.

RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

In the short run, implementing TROA is projected to cause operational changes that will result in more system flexibility to meet long-term future needs. Because of exchange and storage agreements that are components of TROA, a more assured long-term drought water supply for Truckee Meadows would be obtained, and improved flow conditions would be possible for the endangered and threatened Pyramid Lake fishes and aquatic species in general. California's allocation of water for M&I purposes in the long-term will be assured and can be utilized in the short term to improve environmental conditions in the Truckee River.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible and irretrievable commitments are considered to be the permanent reduction or loss of a resource. No irreversible and irretrievable commitments of resources would occur under any of the alternatives.